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Evolution In Dobzhansky And Nogar: A Study In Biology And Theology

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EVOLUTION IN DOBZHANSKY AND NOGAR:
A STUDY IN BIOLOGY AND THEOLOGY

Submitted in partial fulfillment of the requirements for graduation with honors to the Departments of Theology and Biology at Carroll College, Helena, Montana

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This thesis for honors recognition has been approved for the Departments of Theology and Biology.

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INTRODUCTION

The notion of the vast array of different animals and plants evolving as new forms through a slow, historical, natural course from simpler forms is a familiar one. Evolution is a theory that should not be confined to academic circles only; it is an idea about which everyone should be informed. Owing to the vast discussions taking place about evolution, there have been a great number of books written.

This thesis has chosen two outstanding authors and their books to present the theory of evolution. These two authors are Theodosius Dobzhansky and Raymond J. Nogar, authors respectively of Mankind Evolving and The Wisdom of Evolution. These books attempt to explore the possibilities of understanding mankind as a product of evolution. This thesis hopes to present each of these respective works in a clear, objective manner. First, we will present the views of Dobzhansky, and then in the second chapter Nogar's ideas will be illuminated. In the third and last chapter, a concise summary of the two views will be stated while trying to point out areas of parallelism and areas of difference. A proper stance of open objectivity that one should take when delving into the subject of evolution will also be presented in this last chapter. This is not meant to be the only stance available, but only one of many quite possible ones.
Theodosius Dobzhansky gives a profound insight into the biological theory of evolution. Being a scientific theorist, Mr. Dobzhansky gives a well-documented and concise explanation of the evolution of the human race. Using a broad range of knowledge, he creates an interesting and succinct look into the controversial hypothesis of man's origins. It was Charles Darwin who was able to marshall a great mass of evidence making evolution intelligible. T. Dobzhansky makes the acceptance of the theory inescapable.

The opposition to this theory, especially in this era of technology and the Age of Science, is too well known to need detailing. The reluctant attitude can be well portrayed, as Dobzhansky did, in the quaint, little story of the English lady who on being told of Darwin's theories exclaimed:
"Descended from the apes! My dear, we hope it is not true. But if it is, let us pray that it may not become generally known" (9:5). This common feeling on the notion of Darwinian evolution shows how degrading to human dignity some people view it. It also shows vividly how ignorant some people are. To say humans have descended from the apes is absolute rubbish since their remote ancestors could not have descended from animals which are our contemporaries. The fact is man and apes have descended from common ancestors.

The basic thesis presented by Dobzhansky in Mankind Evolving is that humanity has both a nature and a "history". Human evolution is composed of two aspects, the cultural and the biological. These components are "neither mutually exclusive nor independent, but interrelated and inter-dependent" (9:18). Evolution of mankind must be understood
under the light of an interaction of biology and culture; it cannot be adequately described as purely biological nor purely cultural. There exists a feedback between the two processes. To insist that there are two independent evolutions, one organic and the other superorganic, is to substantiate one's misunderstanding of the nature of heredity. Biological heredity is the basis of biological evolution and determines the response of the developing organism to the environment in which it develops.

Modern human's ancestry extends back through the ages to primordial life. Early species arose not as single individuals but as diverging populations; and these races bred in more or less extensive territories. The evolution of the present animal kingdom is usually represented as a branching tree. At its base is some hypothetical common ancestor which diverged to create the present chordate phylum. This adaptive radiation or cladogenesis shows the tendency of the evolutionary stream to become subdivided into numerous lines. Lines that were predestined from the beginning to develop in the direction of humanity; and they did the best they could to reach this foreordained goal. "Man, chimpanzee, and gorilla are contemporaries, reproductively isolated species. But their common ancestor, whatever he may have been and wherever he may have lived, belonged to a species assuredly different from all of them" (9:185). Let us see if we can find out who this ancestor was.

Dr. Raymond J. Nogar attempts to relate both the
theory of evolution and the opinions concerning the philosophical and theological implications of this theory. Dr. Nogar is extremely well qualified to discuss and analyze these implications. He is equally at home in theology, philosophy, as well as biology. His book is not intended to be a biologically-oriented, evolutionary treatise. Rather it is an examination of the philosophical dimension of the theory of evolution. A careful and considerate weighing of the evidence, accepts evolution as the best available account of the genesis of the living world.

Nogar's book, *The Wisdom of Evolution*, is not a specialized biological treatise on evolution. Its point of view is not that of the research biologist or anthropologist, but the viewpoint of the philosopher and theologian of science who is interested in the overall status of the fact of evolution.

Not only does Nogar have the basic facts upon which he builds the evolution case, but he appears to apply a rigorous logic to the inferences which ultimately come about from the evolutionary statements. He explains that one must "penetrate the facts and explanations with the sharpened mind . . . We must try to play the role of scientist-philosopher, insofar as that is possible. At least we must try to see the question through the eyes of the philosopher of science" (22:15).

This book of Dr. Nogar is, therefore, not a strictly scientific textbook on evolution, nor is it a professional course in philosophy. It modestly attempts to do three
things. First, it examines the proofs of the theory on man's origins and evaluates the strength of the scientific fact in the light of anthropology and biology. Secondly, the book designates the extends or limits of the evolutionary theory. This is done by logical analysis, while expounding upon the generalizations that automatically flow from the scientific facts, downplaying those generalizations that do not immediately flow out of the facts. Thirdly, the book attempts to give a synthesis of scientific evolution and a philosophy of life which is both consistent with the known facts and agreeable with the philosophy-theology of present-day Judeo-Christianity.

Most attempts to synthesize scientific evolution with world view have usually met with opposition. This is due to the fear that an overthrow of the general understanding of the universe which underlies the traditions of Christian culture is the inevitable result. It is thought that an intelligent person cannot be a Christian and an evolutionist. It is not perfectly clear how the evolution theory can be succinctly synchronized with the natural philosophy of life, so that all "claims of evolution are satisfied and man's immortal destiny and the providence of God remain a necessary part of the whole picture" (22:16). Dr. R. J. Nogar attempts to bring a harmony out of his book. He states one cannot be viewed correctly without the other. He presents his harmonious vision of the wisdom of evolution.
CHAPTER I

DOBZHANSKY'S YESTERDAY, TOMORROW, & TODAY

The basic premise at the root of Theodosius Dobzhansky's thought is that mankind has both a nature and a history. In this first chapter devoted to his work, Mankind Evolving, I will strive to present this dialectic of Dobzhansky's. That is, that human evolution is composed of two aspects, the cultural and the biological. I will attempt to show how these components complement one another and substantiate one another. It is important to realize that the biological and cultural strands behind evolution developed together. They are interdependent. One cannot dismiss one over the other. The two exist for each other and one cannot be fully grasped without the other. Furthermore, this chapter hopes to bring up points of convergence and areas of disagreement that might exist between this viewpoint of Dobzhansky and that of Dr. Raymond Nogar. These areas, should they exist, will be further discussed in the last chapter. But the ultimate aim of this beginning chapter is to show the dichotomy that existed in the evolution of humanity.

The structure of the human body resembles that of other animals, but the similarity is most greatly seen with the monkeys and apes. Aristotle first quite clearly recognized this in the fourth century BCE. Linnaeus, in the
mid-eighteenth century, included humans in his great work on the classification of animals and considered humans and the anthropoid apes species of related genera—Homo and Simia. Lamarck, although he strongly believed in the Great Chain of Being, was one of the first consistent evolutionists and derived man from animal ancestors. Darwin, in 1859, did the same implicitly in On the Origin of Species and explicitly, in 1871, in the Descent of Man. Since this time, evidence has been compiled (viz. Huxley, Vogt, Haeckel, Simpson, and Heberer) through comparative anatomy, embryology, and genetics that places humans in the zoological order of primates. The evidence still stands, though augmented on several aspects, and these authors would be the first to agree that the basic substance of the matter holds true. Humans are primates and close relatives of the apes.

Logically, it is possible to develop a concise theory in which we would be certain that mankind has evolved but would not know the particulars of the actual history. To trace the historical stages of the evolutionary development of humans and their relatives is quite another problem. Though many stages of their development remain obscure or at best sketchy, there have been many discoveries that help to secure hypotheses. Numerous investigators have devoted their lives to tracing this history and an enormous amount of data has been accumulated. The view that humans have descended from ancestors who were inhuman is, therefore, quite fully verified with regards to the sciences of compar-
ative anatomy, embryology, physiology, serology, genetics, and the specific branch of comparative anatomy - vestigial research.

From comparative anatomy we see that the human body is constructed on the same general plan as that of other animals. There is general similarity with the other vertebrates and mammals, and specific similarity with the primates and apes. Every bone of the human skeleton is correspondingly represented by a bone in the skeletons of apes and monkeys. For example, the long bones of the arms of humans and chimpanzees are very difficult to distinguish, and the same holds for numerous organs and organ systems. Also, specialized traits are shared by people, monkeys, and apes. Among these are stereoscopic and color vision, loss of mobility of external ears, reduction of sense of smell and tactile sensation of hair, occurrence of menstrual cycle, absence of breeding season, birth usually of a single infant, and dominance of adult males over females and young. Comparison of traits between people and apes adds more evidence to their relatedness. Both have large locomotive mobility, large flexor arm muscles, viscera that is adjusted to upright posture, sleep taken in lying position, long periods to reach sexual maturity and full growth. Even the attempts to make man "unique" by finding some component part or structure in the human body that was wholly absent in other primates have been unsuccessful. The differences between humans and apes on this level are simply not qualitative.

However, there may be some examples of how humans differ
appreciably from apes, such as in the case of the human foot and hand. These differ strikingly from each other, while in most apes the upper and lower extremities are quite nearly similar. The origin of this human condition is understandable. The apes are brachiating animals and thus the necessity for two sets of long, grasping arms. Man, a bipedal animal, is pictured to have descended from a brachiating ape who abandoned his life in the trees and assumed life on the ground. This would facilitate the loss of the brachiation—specialized hands to hands used primarily in tool work and eating and the adaptation of the feet for walking and supporting the whole weight of the body. Yet, this is largely a superficial difference. Even the human brain, where one would think any substantial difference would most probably exist, shows no such structure. Broca's area, thought to have developed only in mankind, has been found in the brain of the monkey Hapale. Interestingly, this area of the brain is an important center of speech.

Embryologically, many features of human ontogeny can be assured to be retentions of the developmental patterns of remote ancestors. Examples of this biogenetic law, reminiscent of Baer's law, can be seen in the gill arches found in human embryos and those present in embryos of fish which later become part of the functioning gills. Next, the arteries coming out from the human embryo's heart have a striking resemblance to the arteries of fish. Later they resemble the arteries of amphibians and, later still, they
become totally reconstructed. By this stage in development they have been reconstructed to the extent that they are distinctively human. Also, the embryo of the human has, at one stage, a tail formed like that of mammalian embryos which have tails as adults. Can one discount the inference that our ancestors had functional gills? Hearts like present aquatic forms? Or tails?

Different animals with similar or identical body functions suggest a common evolutionary descent just as resemblance in body structures do. This is where the sciences of physiology, genetics, and serology are helpful as evidence. Most diverse animals respire, digest food, excrete metabolic waste products, and reproduce. And they perform these functions in much the same way. One quite impressive fact is that dealing with enzymes and enzyme systems. Many of these complex molecules and systems, such as the Kreb's Cycle of cellular respiration, have been discovered in organisms otherwise completely different. For example, many of the same enzymes found in human cells have been found in yeast cells!

The basic mechanisms of heredity discovered and formulated by Mendel and his successors are universal. From man to plants, from primates to bacteria, there exists the common structures of genes and chromosomes. All sexually reproducing organisms show, in some manner, the processes of chromosome pairing and meiosis. By far the most outstanding demonstration of the unity of life is given by the discovery of the genetic code. Throughout the living world, this code
consists of only four "letters" that produce the genetic "words" and "sentences" that formulated the expression of biological evolution over the past two billion years. Either this manner of producing life was the most efficient, or it arose only once and all other living things developed from this original state.

Mere vestiges can also tell us of the interlinking web of life. All the numerous muscles composing the human body's musculature are represented by corresponding muscles in the apes. The muscles not found, like those of the external ear, are vestiges apparently without any function at all. So too with the coccyx and the vermiform appendix; corresponding to the capacious portion of herbivorous mammal's intestines. It seems only logical to conclude that these structures are remains of ones that were more highly functionable in the ancestors of mankind.

So it would appear that mankind can date its ancestry back to primordial life. However, we will limit this lineage to the period of mankind's past wherein occurred the separation of the hominid stock from the nonhuman branches. The picture of primate evolution that emerges is, however, a very tentative one certain to be altered by discoveries in the future. The subdivision of geological time which will come under consideration in connection with the evolution of the primate order is that of the Tertiary and post-Tertiary periods, beginning 73 million years ago.

During the Paleocene and Eocene strata (73 to 58 million years ago), the only primates to leave rather numerous fossils are the tarsioids and prosimians. Thereafter
they disappear from the fossil record, perhaps giving rise to higher primates. An important fossil, Parapithecus, was found in lower Oligocene strata in Egypt. Though represented by only a lower jaw with teeth, it appears to bridge the gap between the tarsioids and the Old World monkeys. It has even been speculated to be "broadly ancestral" to the hominid stock. One important fact to remember is that during these mid-Tertiary times evolutionary changes were happening fast among primates.

The next interesting animal in lineage is the Proconsul. Mostly bone fragments have been found, but one rather incomplete and deformed skull from lower Miocene deposits has been found. Analyzing the structure of its teeth and skull, this animal belonged to the family Pongidae, apes, but has some primitive features strongly resembling Old World monkeys. The bone fragments taken from legs show several traits which imply that Proconsul had not yet developed the brachiating specializations of present-day apes. Instead, it probably walked on all fours—a ground-dwelling animal.

Proconsul, although appearing to be close to the common ancestor of the hominid stock, is unlikely to be that ancestor. This is thought, because of a finding of a subfamily, Dryopithecinae, of the anthropoid ape family, Pongidae. From mostly fragmentary remains from Miocene and Pliocene periods (29 to 12 million years ago), what emerges is that during the second half of the Tertiary period the hominid primates were undergoing the aforementioned rapid evolutionary diversifications. The dryopithecines were certainly not
identical with modern apes; the bone specializations necessary for brachiating habit were not even close to being acquired.

The most interesting, but at the same time most controversial, find is that of Oreopithecus. Found in strata dated as upper Miocene to lower Pliocene, its dentition and arm bones have enough humanlike characteristics to warrant classifying the animal with the human family, Hominidae, and not the ape family, Pongidae. If this classification agrees with further studies, it would indicate that a representative of the human family existed as far back as late Miocene times. Furthermore, it would mean that the evolutionary line that culminates with mankind would have separated from that which produced apes no less than 11 million years ago.

At present this is only an unconfirmed working hypothesis, owing to a "missing link" between man and these forebearers. But, we may have found one of these "links": that of Australopithecinae, found in diggings in the southern half of Africa.

By the 1959s, at least 65 and at most 100 australopithecines had been discovered in South Africa alone. The most probable date for them is the Villafranchian stage (1 million years ago), the oldest part of the Pleistocene epoch at the end of the Tertiary period. If this dating is correct, then the australopithecines would fill in the gap between Pliocene and Pleistocene epochs, therefore becoming candidates for the honor of being humanity's ancestors.
Several exciting attributes are shown in the bones of the australopithecines. The shape of their pelvis, particularly of the iliac bone, definitely classifies them as hominid. These creatures must have walked erect, which is borne out further by inspection of the femur and foot bones. Their dentition is likewise more manlike than apelike. Yet, their brain is small and the structure of the skull, while unlike any modern ape, is certainly not human. But authorities view the bipedal stance as more indicative of their humanlike qualities than the pongidlike skull and brain of their apelike characteristics. Another momentous discovery was that at some sites where australopithecine bones were found some very primitive stone tools were found, too. Since these pebble tools were made of a kind of stone which is not found in the rock shelters where the bones were found, they must have been deliberately collected and altered. Therefore, not only were australopithecines tool-users but also the first tool-makers. The richest collecting sites of australopithecines were discovered in South Africa, but other remains have been found elsewhere; further north, in Tanganyika and far east, in Java. If these are true australopithecines, then this would mean that these supposed ancestors of mankind traveled far and continued to exist for a long time, since the Java find is dated post-Villafranchian.

These undoubtedly human remains found in Java and northern China share with us the genus Homo, although they
are not members of our species sapiens. The Java man and Peking man, Homo erectus erectus and Homo erectus pekinensis respectively, have been dated to the geological age of mid-Pleistocene (500,000 years ago). The remains of both are mostly fragments but together give a reasonably complete picture of the whole skeleton and thus are sufficient to establish some critically important points. Homo erectus undoubtedly walked erect; the femur is indistinguishable from modern man's femur. Homo erectus' brain capacity is larger than that of the australopithecines. The shape of the skull is not like modern people's, but more reminiscent of chimpanzees and gibbons. The lower jaw is also unlike humans, while the dentition shows a mixture of human and ape characteristics. Peking man definitely showed the progress to tool use but the level of this progress seems little over that of the australopithecines. Due to the abundant remains of hearths in the caves in which Peking man lived, they obviously were acquainted with the use of fire.

Not far from the place that Homo erectus was found but in a geologically younger stratum, there have been found remains of an animal that can now share both man's genus and species, Homo sapiens, race soloensis. While having a series of traits still reminiscent of Homo erectus, this Homo sapiens has a brain capacity, skull conformation, and mandible shape unmistakably human. These remains are sometimes referred to as pre-Neanderthals, but this race of people lived more like ourselves than the Neanderthalians, and also appears to have abruptly replaced the Neanderthalians.
Therefore, what emerges is the theory that Homo sapiens appeared, disappeared, and reappeared again. In other words, Homo erectus gave rise to Homo sapiens soloensis; which was replaced by the intermediate, Homo sapiens neanderthalensis; which concluded as the most recent ancestor of the full-fledged Homo sapiens sapiens.

The Neanderthal race probably formed in Europe during the last glaciation (Surm - 120,000 years ago) while the pre-Neanderthals were declining due to the severe climatic conditions prevailing. While a continental ice sheet extended down across Russia, Germany, and northern England, the Neanderthals proliferated throughout southern Europe and the Middle East. This best known form of fossil of humans was short and squat, with massive bones, large brain capacity, a strong but chinless mandible, and large teeth. Neanderthals did live in caves, at least part of the time, and was well acquainted with the use of fire and rough stone tools. This hunter of meat and dresser of animal skins was apparently rather suddenly replaced by species whose bones more closely resembled our own.

These Cro-Magnon people were invaders from outside Europe and brought with them a culture extremely different from that of the Neanderthals. The Cro-Magnons were tall, almost 6 feet tall, and of great athletic physique. They were wanderers and colonizers.

In the light of the above information, a tentative attempt to state the path of evolution leading to the emergence of mankind can be sketched. One of the species of
Australopithecus, in order to survive, developed the necessary art of tool-making and tool-use. This, therefore, was a lifestyle not participated in by any other animal species. This new way of life was a challenge to other species, one in which those who participated had to develop better and more diverse tools to survive. This response accelerated the already quick pace of evolutionary change. The species was no longer Australopithecus but Homo. The form that was most successful in this new way of life was Homo erectus. He lived, increased, and spread to new countries. The species Homo erectus lived in a tremendously wide territory spanning from China to Europe and into Africa. As Homo erectus extended into other lands, it differentiated into different races (Java, Peking, etc.) and later became but an ancestor to Homo sapiens soloensis and Homo sapiens neanderthalensis. The classic Neanderthals of Europe were a stable variety during the last glacial phase due to isolation and successful responses to the selective pressures caused by the rigors of harsh subarctic climate. Due to a sporadic survival of the Neanderthals at the end of the Pleistocene period (100,000 years ago), there was present in the evolutionary system a means of development into the species Homo sapiens sapiens.

Thus stating the "history" of humanity the next essential step is that of nature, remembering that evolution is the factual interaction of biology and culture. What is the feedback of the organic upon the superorganic? Darwin in a passage in On the Origin of Species states the action as
It may be said that natural selection is daily and hourly scrutinizing, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life (9:128).

Therefore, the probability that one will survive depends upon the degree of one's adaptability to the environment in which one lives. Natural selection is blind and mechanical, automatic and impersonal. The degree of adaptedness is partially conditioned by the genetic endowment. Carriers of some genotypes will survive, others will be eliminated. Therefore, succeeding generations will not be descended equally from all genotypes, but relatively more from the better adapted ones. The incidence of better adapted forms will tend to increase and the incidence of less well adapted forms will tend to decrease.

So, evolution is brought about by natural selection, which is the outcome of the survival of the fittest in the struggle for life. But, confused and unintended meanings spring up when everyday language is used to construct scientific terminology. "Natural" in natural selection does not mean savagery or any activity excluding man-made changes in the environment. Natural selection is going on in all societies of humans. Natural selection is the "differential reproduction of carriers of different genetic endowments owing to their adaptedness or shortcomings in a given environment" (9:11). Natural selection simply means that the selective process is not one that stems from human choice.
"Struggle" may suggest competition, contention, and warfare, but it does not depend upon these. Animals and plants may avoid cold, heat, desiccation, drowning, etc., but this "struggle" usually is not at the expense of other individuals be they of their own species or not. "Fitness" in its evolutionary sense is the most difficult term whose clarity is still in full debate. Robust health and strong muscles do not necessarily define Darwinian fitness completely. Fitness has through natural selection come to mean fit for community, for wisdom, for endurance, and for longevity, but the bottom line states fitness as measurable only in terms of reproductive proficiency. Darwinian fitness is reproductive efficiency. Health and vigor, prowess and bravery, intelligence and foresight may or may not enhance Darwinian fitness, depending upon how they affect the reproductive potential. Of course, in order to reproduce one has to survive to sexual maturity; but in any species of animal the most fertile is not always the most powerful or tremendously large. Natural selection is not some benevolent "something" pulling and pushing evolution toward a sure and profound success. With these clarifications in mind, we now proceed with the organic or biological facet of evolution.

Adaptation takes place through natural selection. This promotes survival and reproduction of the carriers of some genetic endowments, but inhibits others. Selection selects not only a single gene which is the determining factor for the character being selected, but the entire genotype. So if any mutation had arisen previously --
realizing that it will remain indefinitely conserving its frequency -- then an intensification of the trait results. This is an active participation in the evolutionary process.

We have said that the genes maintain their integrity at a constant rate. The basic self-copying mechanism is heredity and is, therefore, a conservative force. It is not perfect; if it were, then there would be no evolution. The workings of heredity have a built-in feature, in inherent flaw. That is, occasionally a copy of a gene comes out imperfectly. This is a mutation of which we have already spoken. It must be pointed out that mutation is the ultimate source of evolution whether it be in the form of substitutions, deletions, or rearrangements. Mutation establishes the evolutionary status of mankind: be it bad, due to a detrimental mutation; or good, due to the reverse. Perhaps all genes can mutate in many ways, thus making the mutation possibilities innumerable. But no single mutation can, however, directly transform one race into another. This is so because as a rule genes mutate independently from each other. The point to be made is this. The probability that an entire genome would simultaneously mutate to the condition seen in our Pleistocene or Tertiary ancestors, or in our descendants a million years hence, is infinitesimal and can safely be neglected. Mutations arise at random and without direction and so mutations arise whether or not they are useful to the organism now or ever would be. But, mutations do not direct the trends of evolution. Natural
selection does. And the kinds of mutations feasible in our species is determined by the established composition of our genotype. The chemical changes that occur in a gene when it mutates are not random, but their consequential effects on an organism's adaptedness are. Lastly, these mutations absorbed by a species are not at all rare in human populations, or in any organisms for that matter. Therefore, the supply of genetic raw material upon which natural selection operates is ample and the profound effects upon a species' evolution are immense.

The crucial point to be emphasized with respect to the usefulness or harmfulness of a genetic variation on fitness is that of a certain environment. Environment to be understood must be taken in its broadest sense. It is comprised of the physical (temperature, humidity, climate, soil); the biotic (food, predators, parasites); the social or cultural; and the genetic (association of genes in either positive or negative modes). The effects of mutations on fitness are thus contingent on the environment. Also, one must realize that humans are a part of their own environment. They influence the environment as well as being influenced by it. They and their surroundings are really parts of an interacting system.

Although some mutations may be useful and more may be neutral, most are unconditionally deleterious. Considered from the point of view of human welfare, mutation should be regarded as undesirable for people on the whole. Any
increase in the mutation rates is certain to increase the amount of human misery due to defective heredity. It is logical then to state that a reduction in mutations would work toward humanity's benefit. This is not inconsistent with the recognition that positive mutants did occur in mankind's evolutionary line; for if not, humans would not be here in the form they are today. Hence, one can deduce that adaptive evolution does not come from mutation alone, but from an interaction between mutation and selection.

But the question arises: How does this essence of the evolutionary event work? The critical problem is what happens to the mutants after they arise and enter the gene pool of a population? How do selection and mutation interact? We realize that the great majority of mutants are harmful and that natural selection counteracts the spread of harmful genes. It does so more efficiently with dominant mutants than with recessive genetic changes. This is so because a recessive gene is expressed fully only in its homozygous form; in the heterozygous state the mutation is protected and sheltered from natural selection. Consequently, since there is a constant inflow of detrimental genes into the gene pool and natural selection cannot eliminate all these genes in one generation, they persist in the population for some generations. This is a "genetic load" carried in the population; and accumulation of deleterious or potentially deleterious genes with those needed and properly coded genes forming a "balanced" genetic load.
From this first chapter delving into the concentrated work of Theodosius Dobzhansky in *Mankind Evolving*, there are four major points worth restating concisely. These are the major objectives that should be retained from the preceding discussion. First, mankind has evolved in a dualistic fashion; biologically and culturally. Secondly, the sciences of comparative anatomy, embryology, physiology, serology, and genetics support the hypothesis that humanity has evolved from the same ancestors as the apes. True, there are some unexplainable findings and certain uncorrelatable data, but the overwhelming concensus agrees on the basic assertion that lower primordial life was the ancestor of humanity. Thirdly, the fossil record tells us that humanity could have existed as far back as 12 million years ago with the genus *Oreopithecus*. From here *Australopithecus* emerged upon the scene and survived in the genus *Homo erectus*. *Homo erectus* extended into other races (i.e. *erectus* and *pekinensis*) and into other species, *Homo sapiens soloensis*. *Homo sapiens soloensis* evolved into the Neanderthals and these evolved into *Homo sapiens sapiens*. Fourthly, the evolution of living things and specifically mankind is brought about by natural selection. This is the outcome of the survival of the fittest in the struggle for life. The ultimate effect of this genetic variation is dependent upon the environment and the interaction of the environment and the genes has produced a balanced genetic load.

In the next chapter I will be concentrating on the
book of Dr. Raymond L. Nogar, *The Wisdom of Evolution*. I will try to relate the thesis of evolution as proposed by Nogar and try to point out where the parallels and differences exist between this stand and Dobzhansky's.
CHAPTER II
MODIFYING COMMON DESCENT

This chapter has as an underlying current the premise that Dr. Raymond Nogar presents in his book, *The Wisdom of Evolution*. This current or premise is that humans and apes have descended from a common source and have done so in a modifying manner. I will strive to present this notion of Nogar's, while at the same time bringing out his ideas on the double-faceted nature of this descent with modification. These two facets that Nogar speaks of are precisely those we have seen in the preceding chapter on Dobzhansky: the biological facet and the cultural facet. Nogar places more attention upon the cultural facet than Dobzhansky and, therefore, this chapter will focus more heavily upon this dimension. Nogar takes somewhat different avenues to verify and substantiate his theory on evolution than Dobzhansky does and these variations from Dobzhansky will be presented. First, I will start off with the Darwinian concept of natural selection, the concept upon which Nogar bases his work.

Charles Darwin did not invent the term "evolution". He is, however, responsible for the most popular usage of the word which has produced a 180 degree turn in the direction of scientific and philosophical thought since the publication of his great work, *The Origin of Species*, in 1859.

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Charles Darwin delved into the new science of natural history, the field studying the life of plants and animals. The key idea that predominated in his mind and gave profound insight to his detailed and careful notes was that the "vast panorama of plants and animals he observed was the result of common descent with modification" (22:28). This is what evolution meant for Darwin: common descent with modification.

Darwin so thoroughly substantiated his theory of how evolution of animals and plants occurred that the whole of science had to take notice. It was another idea, a great idea, an idea with far-reaching consequences for science and philosophy. The idea was that the grand diversity of life forms, living and dead, has resulted from an irreversible, one-way, historical process. Novelties, variations on the old, and higher organizations have arisen by a natural process from the simpler, more common elements. The process of this unfolding and elaboration is termed evolution, and it operates in every nook of the world especially that most fully described and analyzed by biology.

It was an idea that could easily organize the world of life sciences into a neat, coherent, concise package, if it could be well substantiated. Over the past hundred years since, careful and cautious research of the biological implications to man have taken place. Many great scientific advances in evolutionary teaching have made the concept strong where once it was weak. Perhaps evolution is only a "hypothesis", a grand theory which attempts to bring together
a host of facts. But the basic assertion of most scientists today when they speak of evolution is that it is no longer a good hypothesis, a valid theory. It is a scientifically established fact. Now with this facet of the issue stated, let us consider the evidence for these views. The big question is: Is evolution, as defined by the contemporary scientists, a fact? One must marshal the evidence which is seriously put forth by science and which converges toward favoring evolution.

In order to apply fully the substantiating evidence in favor of evolution, it would be wise to state Darwin's argument for natural selection. His is a good combination of induction and deduction and he argues that natural selection must necessarily take place. By way of summary, Darwin's concept of natural selection -- the best metaphor he could find -- shall be briefly attempted here. First, all organisms reproduce in excess of the number of offspring that can survive. There is an obvious waste of potentiality in nature, for only a small fraction of the reproductive cells fashioned by nature ever reaches maturity. But, in spite of this waste and excess in nature, adult populations remain fairly constant for each given area. There is a certain amount of variation in numbers, but the overall population is constant. Next, there is the fact that struggle for survival will occur. This is both an induced and a deduced fact. No organism is going to give up its life without a struggle. Each will make every effort to sustain life. All this does not mean that cooperation is unnecessary. So long as an organism can
survive better in a partnership, cooperation will take place. This struggle does not occur only among similar species. Due to the fact that organisms vary appreciably, struggle for survival is waged upon individuals slightly different from one another. It is through this behavior that the next point emerges. Nature acts as a unit to select different varieties of organisms to survive and prosper and others to decline and become extinct. These remarkable changes are accounted for by the fact that many of these adaptive variations are passed on, passed on by heredity. (Unfortunately, Darwin had an erroneous notion of heredity and this caused a temporary lapse in his theory of natural selection.) Lastly, this device of natural selection occurs constantly to modify, diversify, and improve existing species so as to fit more appropriately the changing environment. This was Darwin's concept of natural selection, and the one upon which Nogar bases his work.

However, in order that these facts be truly demonstrated and verified, it is necessary that Darwin's faulty view of inheritance be rectified. Darwin assumed that variations in general were hereditary and, therefore, natural selection acted upon this variation to produce the observable discontinuity of species. His view of inheritance was defective, however; and now the presently accepted theory will be stated.

That part of the organism which is directly involved in inheritance is called the germ plasm. And the gene, that
entity concerned with transmission of hereditary characteristics in organisms, is regarded as a small part of the chromosome lying in the germ plasm. The principal factor of reproduction, of passing down to the progeny the parental characteristics, is the gene, and it takes a large number of pairs of genes to transmit all the hereditary factors. The genes, in the process of reproduction, tend to produce exact likenesses of themselves. However, occasionally the genes fail to produce an exact replica. They are imprecise. The result is a change in the gene, called a mutation. These rare, sudden, natural changes are ultimately the true cause of variation in nature. Mutations are the materials upon which natural selection works. The direction of mutation is not determined by the environment, but the fate of the mutation is determined by natural selection. Gene mutation is the subject matter of evolution.

Darwin, carefully reading the pattern of life's distribution over the face of the world, hit upon the key to the structure of life: the only known cause of close similarity existing in the living world is common descent. For this to be adequately proven, at least in a grand, sweeping manner, one may look to the fossil record and the science of paleontology. This is the primary and most direct evidence in favor of evolution on a large scale. The problem of prehistory is most difficult, but owing to the admirable refinements of methods of the paleontologist, there is a vast amount of documented evidence, so that any objective observer could not reject their findings.
Simply put, the first main conclusion to be inferred from the paleontological record is as follows: there is the presence of very simple forms of life, very few in number, that existed in the early periods. The fossil record also indicates that there was a progressive multiplication of numbers and kinds of organisms from simpler to more complex forms throughout the passage of time. And lastly, paleontology shows that most species of former ages have become extinct, being successively replaced by our present-day forms. Therefore, the fossil record makes the theory of evolution a highly probable explanation of organic origins: descent with modification from common ancestry.

Nogar continues to say that the paleontological record could be explained through sequential creation. That is, each new proliferation of species could be explained as a special act of God; God could have extended His creative power in any form He so chose. But there is a very important reason why the theologian and scientist would view this model as unsatisfactory. All would agree that a natural explanation should be sought. "To invoke the extraordinary, the miraculous, in explaining the course of natural events is not good theology, nor is it good biology . . . The theologian, as well as the scientist, is bound by an important axiom: God works in an orderly fashion through natural causes" (22:62-63). Because a natural explanation for the origin of species is available, it should be used.

Nature reveals herself not only in the fossil record of extinct species, but also in the pattern of the parts of
organisms living and dead. Darwin said the only known cause of such close similarity is common descent. Therefore, the argument from comparative anatomy, the science which compares the parts of organisms for their similarities and differences, has always been a forceful one.

Comparative anatomy studies the relationships among organ systems of diverse kinds of organisms. A careful study of the vertebral column of the vertebrates shows that in the original development, the final structural configuration is extremely similar in the primitive living vertebrates, the sharks, the amphibians, the reptiles, the birds, and the mammals. A basic structural pattern has been preserved. The differences seem to lie more in the realm of functional adaptation. The adaptation can be traced in the development of the forelimbs of mammals. The design of the forelimb is structurally the same, bone for bone, but the function of the forelimb ranges from digging to running, from flying to writing poetry. This functional variation is accompanied by differences of the proportion, and sometimes by fission of parts, but the basic argument for common ancestry is still persuasive. The last anomaly comparative anatomy has become aware of is that of rudimentary and apparently useless organs. Among these; the vermiciform appendix, the third eyelid, the ear muscles, the vestigial caudal vertebra and wisdom teeth -- together they show how many organs there are that are truly vestiges of former functional organs. It is generally agreed that some organs and organ systems do lose their primitive functions, then becoming partially or totally useless. This process, in the course of adaptation, lends
support to the conclusion that structures do become modified by mutation.

The arguments of paleontology, genetics, and comparative anatomy are just a few of the materials that converge upon and mutually support the conclusions of common descent with modification. The "general" argument for the fact of evolution is assuming strength and attaining clarity. However, we have yet to examine the "dynamic" pattern of life, the functional sciences. We now shall do that.

Life is self-initiated, self-maintained "increase and multiply" (Gen. 1:28). The structure and function of living organisms are but variations on this motif. To truly unite the world of life in a binding, functional coherency, one can look at the certain, functional properties in all living organisms. The common functional properties of living organisms are such things as: cellular organization, chemical composition, metabolism, and adaptation and irritability. It is an amazing thing that despite all the thousands of species existing, they all have these properties in common.

Living organisms are highly organized, heterogeneous units, and in multi-celled life, the cells are functionally manifold. However, the basic structure and function of the cell and its components is found in almost every living thing. The basic functional organization of living matter is common to all living things and is best explained by common descent with variation. Likewise, it is notable that in spite of all specific differences among plants and animals, they all have the characteristic blend of carbon, oxygen, hydrogen, and nitrogen combining to form proteins,
fats, and carbohydrates. These chemicals are combined in almost infinite varieties to produce the basic, functional substances of life. Each species finds ways to vary the pattern of use, but again the organic materials used are held in common. That all living, organizational systems should have this functional, chemical composition in common suggests an origin in a common source.

Most remarkably, living things are constantly engaged in taking substances from their environment and turning them into a living part of themselves. They maintain themselves through a constructive metabolism, anabolism. The organism accomplishes this by nutrition, growth, and repair. These commonly observable functions represent fundamental, basic similarities of life. Also included in the metabolism of living organisms is that aspect of species-perpetuation or reproduction. Each normal life cycle is fulfilled by growth, the insurance of individual survival, and reproduction, the insurance of species survival. The fact that all living matter has the functional pattern of birth, growth, maintenance, repair, reproduction, and death shows the universal unity of living nature. This strongly suggests a common ancestry for all living things.

If growth and reproduction are the key achievements of life, then adaptation is the key means to those ends. Animals live in their surroundings. The inherent capacity for reacting to environmental changes by changes in the equilibrium of living matter is called irritability. Irritability is common to all living substances. Depending upon their
specific orientation to the niche in which they live, plants and animals adapt in different ways. These different kinds of irritability and adaptation functionally differentiate plants and animals among themselves, but the remarkable fact remains: all life is united in the common attributes of some form of irritability and adaptation. Again, this common characteristic of life suggests common origin.

The founders of biology and the early proponents of biological theories did not infer descent with modification from these common, functional characteristics of life. The argument, taken by itself, is not conclusive enough by any means. The hint that the theory of phylogeny might be the explanation of the functional similarities of all living organisms simply opened many new fields of detailed analysis of the various parts of functioning organisms. Two biological disciplines have shown remarkable development: comparative physiology and comparative biochemistry. These departments of biology study the functional aspects of living organisms and compare them for similarities and differences.

What is asserted of the cellular and chemical properties of living things in general is borne out in the details of the functional parts of organisms. As an example, it is known that heredity is physically based predominantly in the chromosomes. When the chemistry of the chromosomes is analyzed, it is found that the chromosomes consist of similar basic proteins combined with nucleic acid. This is found universally. It is amazing to find the same chromosome types uniformly throughout the entire living world. Could Darwin's theory of descent from common ancestry with natural
modification be more strongly suggested? And the same inference is borne out by the biochemical analysis of hormones and enzymes, from evidence drawn from comparative serology (notably in the physiological process of immunization), from embryological sources, and the list continues. But no matter how extensive the lines of evidence become, the same conclusive inference rings clear. Functional analysis of organic wholes and their parts add affirmative arguments for the fact of biological evolution.

No matter how diverse the species, be they either simple or complex, all living things have remarkable functional activities in common. Their cellular heterogeneity; their carbon-centered chemical composition; their metabolic processes; their irritability and adaptation are fundamental common heritages. And what is said of their organic whole is also rightly asserted of their functional parts such as enzymes, chromosomes, hormones, blood immunization, etc.

No one piece of information is conclusive, but taken together and added to the evidence brought forward by paleontology, genetics, natural selection, and the morphological sciences only one conclusion can be seen. There is a powerful convergence upon the evolutionary origins of organisms. Descent with modification is the only reasonable natural explanation. The evolution of life is the best explanation of the facts of these sciences.

There is a specific evolutionary interest in mankind's origin. Homo sapiens is the dominant natural species both in distribution and ability to adapt. Humans have truly
fulfilled the scriptural command to "fill the earth, subdue it, and rule over the fishes of the sea, and the fowls of the air, and all living creatures that move upon the earth" (Gen. 1:28). It is of special interest to the evolutionist that the life history of this particular species be known. But Nogar's book is not a specialized biological treatise on evolution. He is more a philosopher of science and presents his case from this viewpoint. He presents both the biological and the cultural aspects but delves into the latter to a much greater extent. He attempts to show that "man descended from the lower Primates and that all his powers, biological and psychological, body and spirit, took their origin from the lower forms" (22:128). So a well authenticated documentation of the phylogeny of the Primates would be forceful evidence for the fact of evolution.

Darwin attempted to include humans, body and spirit into the evolutionary pattern of all life. At the time of the publication of The Descent of Man, it was widely debated whether humans should be placed totally outside the evolutionary picture or whether they should be placed totally within its boundaries. The evidence for the origin of the biological faculties of humanity from the Primates was good, but the origin of morality and intelligence could not be explained by physical descent. Psychologically, people's origin lay somewhat outside of the theory of evolution. Recent advances in research on human origins affirm and accentuate the essential nature of allowing physical and cultural anthropology their distinctive principles.
Biological evolution and cultural evolution are quite different and distinct principles. Though they belong to the one history of humankind, they must be studied apart from one another. Two terms have been canonized to carefully describe this difference: biological man and psychological man. But, there is an improper attitude that has developed in the scientific consensus. Generally, the scientist prefers to remain neutral about the ultimate explanation of the new, creative intelligence in humans. The biological continuity of humanity seems to be assured. Genetically, and by natural processes, the material aspect of this mental faculty seems to have come about like all the other evolutionary changes. The scientist believes this, but feels also that this is as far as his scientific discipline can take him. Although it must be admitted that progress and change in human evolution operate on two levels, the principles of biological evolution are not the same as those of psychosocial evolution. The questions of the origins of biological humanity are not the equivalent of the questions of the origins of psychosocial humanity.

However, man is not two. He is one person. Man is not a mere biological body, nor simply a psychological entity. Man or woman is a unified biological, psychosocial organism. A human being is a unit, a complex unit, but a unit nonetheless. So we shall see if evolution can apply to humanity in every aspect and to what extent this application can reach.

Do the facts brought forth from the conventional
sciences -- taxonomy, comparative anatomy, the functional sciences and genetics -- support the conclusion that biological humans evolved from the lower Primates? We will first look at the argument from taxonomy to see if in Primates there exists a progressive similarity of structure as one descends from the higher categories of the taxonomic scale to the lower. If this exists, then one can state that the only natural cause for it would have been evolution. Therefore, biological humans and the other Primates must have had common ancestors.

From taxonomy, we will look at the class Mammalia and the extremely strong evidence from the order Primates. The Primates, with humans as the most specialized member, are a large and varied group and are commonly divided into three subdivisions: Cercopithecidae (Old World monkeys), Cebidae (New World monkeys), and Hominoidea (the apes, manlike apes and humans). The latter hominoids also include the fossilized extinct forms of great apes; Pliopithecus, Proconsul, and Dryopithecus. Also there are the three genera: Australopithecus, Pithecanthropus, and Homo, the latter further divided into Homo sapiens neanderthalis and Homo sapiens sapiens. Australopithecus can be classified as a parallel diverging species to mankind or the precursor of Homo itself.

Of primary interest to us here is not the classification but the fact that mankind falls naturally into place. The converging similarity and gradual structural gradations among the monkeys, the great apes and humans are remarkable.
Very minute measurements have been done and refined rules established. Humanity's biological relationship to the order of Primates is documented completely. Homo sapiens is taxonomically close to the fossil manlike apes, which in turn are close to the pongids, the great apes, which in turn are close morphologically to the monkeys, etc. Thus the taxonomic argument that biological man evolved from ancestors common to the great apes is as strong as the general argument of evolution from taxonomy.

Without tracing the entire vertebrate prehistory, experts place the beginning of anthropoids somewhere around 36 million years ago, in the Oligocene Epoch. At the beginning of the Miocene Epoch (c. 25 million years ago) the family of monkeys, New and Old World, and the hominoids branched off into separate developments. Precisely, the hominoids branched into the hominids and the pongids during the Pliocene Epoch. The latter proceeded to develop many genera of great apes, such as: the gorilla, orangutan, chimpanzee, and the gibbon. The former, by the opening of the Pleistocene Epoch (c. 1 million years ago), had begun their development into a group of manlike apes called the Australopithecines.

This family of manlike apes, the Australopithecines, was markedly different from the pongids. They were apparently bipedal, small-brained, hunters of small mammals, tool-users, and possibly tool-makers. The diagnostic anatomical features show them to be midway between the pongids and the hominids proper, but the traits are still far from Homo characteristics. Midway, however, between the genus Homo
and the whole australopithecine group is the Pithecanthropus group.

The best known fossils are *Sinanthropus pekinensis* and *Pithecanthropus erectus*, Peking man and Java man respectively. These were anatomically more like modern men and women, yet very similar to the larger australopithecines. The members of Pithecanthropus, when compared to *Homo sapiens*, have less extensive brains and apelike faces; yet they do resemble *Homo sapiens* more than do the Australopithecines.

The next group of fossils are the pre-*Homo sapiens* group who flourished from 400,000 until 240,000 years ago, and manifest anatomical characteristics even nearer to modern people. The important feature of these fossils was that it was previously thought that Neanderthal Man (c. 70,000 years ago) was the immediate forebear of *Homo sapiens*. These fossils, ranging from 200,000-400,000 years of age, proved to antedate Neanderthal Man considerably and yet were closer to *Homo sapiens* anatomically than was Neanderthal. Theoretically, the members of this pre-*Homo sapiens* group flourished alongside Neanderthal, then the latter became extinct, and *Homo sapiens* issued from the former.

The last group of fossils to appear on the scene which resemble modern Europeans are most widely known as Cro-Magnon. Flourishing between 44,000 and 10,000 years ago, they form the next link in a consistent picture of the emergence of mankind. A gradual temporal-anatomical development is borne out by these fossil finds. Therefore, most
authorities believe that the human race is monophyletic in its origins. Scientists are almost unanimously agreed that humans came from "one single stock, one stem, or what they call one phylum" (22:152).

That humans have a morphological relationship to the other vertebrates, living and extinct, is evident also from structural similarities, homologies and rudimentary organs. There are close to a hundred such vestigial characteristics in humans (vermiform appendix, caudal vertebrae, and wisdom teeth) and these structures can be traced to other members of the mammal class. Almost every comparative study of the structural parts of people and the other anthropoids shows this remarkable graduation from the monkeys, through the great apes to humans. If the only known cause of close similarity in organic nature is common descent with modification, comparative anatomy yields the same conclusion as taxonomy. Biological humans and the great apes have common ancestors.

It is all too obvious that the argument from general biology applies to biological mankind. The fundamental life functions of cellular organization, specific chemical composition, maintenance, growth, repair, reproduction, decay, and adaptation are found in humans in much the same way as they are found in other living organisms. And the same can be said for the other functional sciences of embryology, physiology, and biochemistry. In looking at the study of the individual development of an organism from embryo to adult stage, one sees that not only are the early embryonic stages of natural groups indistinguishable but
they pass through amazingly similar stages of development. It is only as the development progresses into later stages that the differentiation becomes apparent. The well-tested empirical rules of K. E. von Baer hold true universally, as does the elaborated biogenetic law of E. H. Haeckel stating, "ontogeny recapitulates phylogeny" (22:121), as it is understood today. Human beings diverge, in their embryonic development, from the higher apes long after the similarities to other vertebrates disappear.

It is also true that the physiological and biochemical characteristics of humans closely resemble those of the apes and manlike apes. For example, as stated earlier, immunization research has linked humans directly to first anthropoid apes and Old World monkeys and then to New World monkeys and lemurs. The picture is substantiated by biochemistry -- lines of evidence too numerous to consider -- and hence, these fields have the great significance of arguing for an evolutionary relationship between Homo sapiens and Primates.

It is common knowledge that Mendel's "Laws of Inheritance" apply to human heredity. Not only do the laws of genetics apply to humans but also the laws concerning mutations. There are literally hundreds of inherited genetic disorders in people that attest to the fact that mutations arise and are inherited. There is every reason to believe that genetic variation arises in human beings according to the same rules that govern variation in other mammals. Along with this is the concrete evidence that natural selection is at work in them discontinuing certain biological
traits. Mutation and selection, along with genetic drift, migration, isolation, and other supplementary phenomena, help to explain the existence of the various races of mankind and their biological characteristics. Both genetic mutation and natural selection operate in humans as they do in other animals, but it is important to remember that they are not isolated from the cultural factors dominant in adapting humankind to its surroundings. How genetics and natural selection work with cultural transmission and the human psyche to determine the speciation of biological humanity will be seen later.

However, from this long and somewhat technical discussion on the biological origins of men and women, a few statements can be made. The paleontological record shows humans to be a very recent addition to the vertebrates; *Homo sapiens* is less than one million years old. Moreover, biological methods show close structural and functional similarity between humans and the members of the primate group. This similarity is progressive and gradual. The same life functions exist in humans as in the other mammals and the similarities are greatest at the level of the apes. Genetic mutation, laws of inheritance, and natural selection are operative in men and women just as they are in other members of the animal kingdom. There seems little reason to remove the human body from the forces which have distinguished the other biological species. Why should the human species get preferential treatment? The general argument for descent with adaptation seems equally cogent in the case of biological man. Each piece of evidence,
be it from paleontology, genetics, taxonomy, comparative anatomy, general biology, embryology, physiology, biochemistry, or natural selection, points to the same investigative conclusion: descent with modification.

Now, remembering that mankind's evolutionary development has a psychosocial stem alongside the biological, we move forward to talk about this cultural strand of development. The important truths about the origin of humans can come from this other source. Scripture scholars and theologians rightly affirm that "it must not be assumed that only the positive sciences have a little to speak with authority on the question of the origin of man's body. The sources of revelation, say the theologians, demand the greatest moderation and caution in this question" (22:154). That question is: Can the fact of biological evolution be extended into the realm of the psychosocial system of development?

Humans are a peculiar animal. They have intellects and wills and have fashioned a culture. They have been endowed with psychosocial powers which give them much more adaptive range. They have the powers of conceptualizing, judging, and reasoning; they have the powers of willing, free choice, conscious purpose. Only human beings can refer means to ends in terms of their own good and happiness, their own moral sense. And finally, everyone has a spiritual or religious sense by which they have a natural desire to know the most perfect of all beings -- God Himself.

These faculties, and others, must have as their source or principle something non-material or spiritual. Christian
philosophy and theology consistently stress this, although it is based upon an analysis which goes beyond positive science's methods. Physical and cultural anthropology do not speak of this spirituality of humans. Their own methods do not extend to such an analysis. The human "soul", or better yet the spiritual principle of humanity's existence, is not a subject for anthropological research. To the philosopher and the theologian, it suffices to know that when hominid prehistory unequivocally manifested the presence of abstract thought and free choice, then a spiritualized animal came to be.

The experts on cultural studies, on the psychology and sociology of humanity, realize fully that humans were involved in a novel system of development, a new kind of evolution. They seek to preserve and clarify this new mode of development while at the same time being careful not to confuse the biological continuum which humans appears to have had with the other Primates.

Biological evolution has been defined by Darwin as organic descent with modification by natural selection. In no manner can this definition include what is unique about mankind's cultural development. Some scientists do not admit such uniqueness, such independence. They insist that biological and cultural evolution have a long-range convergence and interdependence. To pacify these people and still keep the uniqueness of humanity's development intact, the following definition of cultural evolution can be stated: "Cultural evolution is the spatial and temporal development
of human culture (psychosocial man) in the context of its biological basis in genetic transmission." (22:167) This definition retains the continuity of biological descent while stating that within this context there are the psychosocial forces of humans flourishing. Nature and nurture are correlations, but in cultural development a wide range of psychosocial behavior is open to men and women. The knowledge of what they can do in the future rests upon what they have done in the past and what they are doing in the present.

Cultural anthropology, therefore, has its guard up constantly against the biological analogy which confuses biological evolution with cultural development. The traditional view in anthropology is that cultural evolution is an extension of biological evolution only in the chronological sense. This is dangerous methodology. This picture of psychosocial evolvement includes the assumption of the chronological sequence of history, but also implies a cause-effect relationship. To consider mankind as a whole, we find that science does not give us a simple answer with regards to both our organic and superorganic origins. The limit to the evolutionary explanation of the origin of humanity by no means renders it of little value. It is of great value, but it is incomplete.

Therefore, cultural evolution is the "spatial and temporal development of human culture in the context of its biological basis" (22:178). Mankind shares its
biological nature and its evolution with the rest of the psychosocial powers, which were not received entirely from nature and from evolution, having developed through specialized adaptation. Mankind shares with the world all the generalized tendencies of nature. We are biological organisms which adapt with many of the inclinations with which other animals are endowed. But we alone can see the reason for the order of the means which must be used to the end of adaptation. Mankind can perceive and understand that it is the inclinations of the whole of humanity that must be attained if humanity's specific adaptation will take place. Men and women are not merely biological organisms: evolution, then, cannot be merely a question of biological adaptedness. It remains for the future to regard the world of nature and the evolutionary process as needing both the dimension of biological origins and the dimension of cultural origins.

From this chapter looking at the work of Nogar, we see five points pertinent enough to require summarizing. First, Dr. Nogar sees humanity as having modifyingly evolved in a dualistic fashion (biology and culture) from an ancestor common to itself and apes. Secondly, precisely as Darwin viewed it, natural selection and gene mutation are the subject matters for this evolutionary process. Thirdly, the science of paleontology substantiates this view of mankind's evolvement and comes to the same conclusion as that stated in the chapter on Dobzhansky. Namely, humans have as their lineage: Australopithecus, which gave rise to

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Homo erectus, which evolved into Homo sapiens solensis, which further evolved into Homo sapiens neanderthalis, which culminated in Homo sapiens sapiens. Fourthly, the fields of comparative anatomy, comparative physiology, and comparative biochemistry further re-enforce the theory of evolution as presented by Nogar. Fifthly, while Nogar recognizes that mankind evolved both organically and super-organically and to comprehend one you necessarily need the other, he places more stress on the superorganic or cultural. This is simply because of the fact that his knowledge lends itself more to this facet than to the other. But the basic conclusion is that both are equally essential.

In the next chapter, Concluding Reflections, we will see precisely where Dobzhansky and Nogar meet and differ with respect to their theories of the evolution of mankind.
CHAPTER III
CONCLUDING REFLECTIONS

Finally, we come to the point in this thesis where I compare Raymond Nogar to Theodosius Dobzhansky. I will try to present in short, yet concise form, each respective view on the evolution of humanity. In this process I will attempt to show parallels and areas of difference between the two viewpoints that might possibly exist.

Both Dobzhansky and Nogar would wholeheartedly agree that human beings and apes have evolved from a common ancestor with modification. They would agree that the Darwinian concepts of evolution, natural selection, and gene mutation culminates exactly in this statement. Dobzhansky would place more emphasis upon the principles of Darwin and genetics, but Nogar would likely commend him. Nogar, as stated by himself, is a philosopher-scientist and does not have the vast backing in genetics that Dobzhansky does. Dobzhansky is a geneticist; is more ept in the field; and it is reasonable, then, that he should place more emphasis upon the principles therein.

Each theorist, Nogar and Dobzhansky, have a resounding claim that mankind has evolved from an ancestor common to apes in a two dimensional manner. Humanity has evolved biologically (organically) and culturally (superorganically).
Both support one another in saying that these two dimensions are equally necessary for a complete understanding of the theory of the origins of men and women. One should not discount one dimension and focus on the other, nor even put one dimension over the other. The biological and cultural processes of evolution are interdependent and interrelated. Nogar, however, believes that one should study each dimension separately from the other at first and then integrate the findings of the two. Dobzhansky might disagree with this format of study--that it is the wrong execution of the right idea. But if the ultimate goal of integrating the two dimensions and placing equal emphasis upon both is reached, then this is the important fact that Dobzhansky would stress. However one reaches this goal is incidental; the end would justify the means. Also, Nogar places more emphasis upon the cultural aspects of humanity's evolution. Dobzhansky would view this as a reasonable approach because Nogar himself states that his book is not intended to be a biological treatise on evolution. Nogar takes the role of scientist-philosopher, insofar as that is possible. And the fact that Nogar places more emphasis upon the cultural does not negate the biological, but simply adds that often overlooked dimension to the biological.

Lastly, Dobzhansky and Nogar use the same sciences to help substantiate their theories. They make use of comparative anatomy, biochemistry, and physiology; paleontology, genetics, serology, and embryology. They might approach these conventional sciences with varying degrees of emphasis, but they ultimately verify the same basic theory. Therefore,
this only shows that the issues surrounding the theory of mankind's origins are multifaceted and these different avenues of verification will stimulate and clarify further research.

The twentieth century has been an age filled with unbelievable events. In evolutionary thinking, the scene has been drastically changed from the days of controversial, bitter debate between the forces of the scientists and the experts in theology about the consequences of evolution. At the time of Darwin's publishing of Origin of Species, there was no doubt that this book and the Bible directly opposed and contradicted each other. This contradiction seemed severe and fatal. Many believed that the Bible condemned evolution, and did so to a wide extent. And many believed that evolution was skeptical if not atheistic about God and had little if anything to say about the Divine. Nowadays, it appears a reversal of thought has occurred: the Bible is neutral about evolution and evolution reveals a lot about God. This new stance is due primarily to the great advances that have taken place both in biblical scholarship and the area of scientific evolution.

Realizing that this thesis hopes to view objectively the double-sided subject of evolution, then there are two questions that fundamentally come to mind: What does God say about evolution? and What does evolution say about God? This thesis will strive to suggest a satisfactory and balanced solution to these difficult problems. The goal seems well within arm's reach due to the reassurances seen
in the general attitude which prevails in most camps, be
they scientific or theological.

From the beginning of the emergence of scientific
evolution as a respectable hypothesis concerning the origin
of inorganic and organic species, including biological humans,
the account of origins as seen in Genesis seemed to have been
violated. In traditional Judaism and Christianity, the words
of the Bible, especially those of Genesis, are considered
to be inspired by God and thus infallibly true. If the
natural process of evolution is the truth behind the exist-
tence of all the wide varieties of things on the earth, then
what becomes of the divine activity of the Creature in the
scheme of living things? One cannot make a strict conformity
between the Bible and the facts of modern sciences. Nor
can one assume that the Scripture writers had previous or
revelatory knowledge of modern science. One can, however,
say that "the Bible is not a scientific textbook but a book
that sets forth religious truths designed to manifest to
man the path to eternal salvation" (22:296). Science asks
how the heavens go; the Bible asks how to go to Heaven. The
religious question cannot be answered by the techniques of
science; nor can the biblical accounts give credibility to
the scientific account of origins.

Modern scholars of the Bible seem to agree that it
was not the intention of God nor within the power of the
authors whom He inspired to deal with the manner of origin
of species. It is not reasonable to think that either would
or could have revealed the chronology, dates, or details of
human origin. To believe this, as Scientific Creationism seems to do, is faulty theology and absurd biology. What appears to be the message of the Bible's silence, and hence Christian tradition, is to teach in a striking manner the basic religious truths about the dependence of the universe upon the Creator and humankind's relation to this Creator and other creatures.

However, there are possible texts in Scripture that could bear directly or indirectly upon the question of humanity's bodily origin. Pope Pius XII reminded theologians that the evolution as stated by Darwin is a question to be discussed by both scientist and theologian. Although it is definitely true that the first role of the Bible is the teaching of religious principles, there is the potential role of revelation of certain natural truths to be found in the course of this religious teaching. Present exegesis is a difficult and obscure task to begin with, and to apply this study to human origins simply compounds the job. But, to attain the proper meaning behind Scripture, the task must be done. The end product of this task is to affirm that God created the world, and He did it through the process of evolution.

Evolution as a historical process is established as thoroughly and completely as science can establish facts of an event unwitnessed by human eyes. At present, an informed and reasonable person can hardly doubt the validity of the evolutionary theory. Evolution as a theory has the great advantage of being a natural, consistent, coherent
explanation of human origins. The consistency lies in both fields, science and theology. Both disciplines agree on the distinction the evolutionary theory places between biological and social humanity. Both equivocally recognize this double aspect of human nature, hence each define men and women as rational animals. Their structural and functional faculties gave them something in common with other animals, and yet there was something quite proper to themselves, their rationality.

But to place the entire credit of creation upon God's capabilities is meritable, yet still a personal interpretation. The question is: How logical is it to accept this notion? Is it substantiated? All one can say is that it follows the cardinal rule of interpretation. That is, an interpretation is valid only as far as it enables one to discern and declare what was intended to be said by the author. For the details of the accounts of origins in Genesis are fundamentally accepted as relating in a simple and symbolic manner the truths proposed for the "economy of salvation" (22:300) of a less developed, less sophisticated people. The work of creation distributed over a span of six days is nothing more than a literary device. The order and manner of creation was beyond the author's and readers' scope. Therefore, the conclusion is that the Bible simply does not say one way or the other how and when life began. Likewise, though, science is neutral and silent about the religious truths cited in Scripture. The scientist does not address himself as a scientist to their truths or
falsities. He realizes that science is proximate and cannot investigate the creative, providential actions of God. Therefore, theoretically the scientific and theological accounts of origins should never conflict. It is only logical to assume this, if one accepts the above statements to be true.

Unfortunately, the Bible and scientific evolution seem to be at odds at certain points. This is because the discussion of the evolution of humans involves fundamental questions concerning human dignity, destiny, faith, morals, and a philosophy of life. However, it is generally agreed that in its strictest sense, the theory of evolution does not fully account for human origins as a whole. This is so because it does not account fully for the spiritual and intellectual capacities nor the destiny of mankind. The complete explanation of the origins of humankind's bodies, as stated by Nogar, depends on one's view of the origin of spiritual faculties, and this question lies in the domain of philosophy and theology.

It is necessary now, in order to point up the problem involved, to list out the truths about humanity being taught by the inspired writers in the book of Genesis. To start off, people owe their existence to the special intervention of God. They are endowed with natures that set them apart and elevate them from the other animals. They are masters of their world. Humans were created male and female in order that the human race might be propagated. Despite their difference in sex, both man and woman are like unto
God, therefore, woman has the same nature as man. Their souls were created immediately by God and are spiritual and immortal. The human body, no matter the source of origin, is under the guidance of God's special providence. To conclude and also to be more ecumenical, one could state that human beings owe their existence to the special intervention of a God-like Force; this Something Else beyond has made them masters over the earth; an Omnipresent Being created them and commands them to propagate; this Divine Entity created their souls immediately and guides them as Its providence so chooses.

These religious truths, basic to Christian tradition, have not been arrived at arbitrarily. Just as the paleontologist scrupulously applies the methods of proper research to his field, so also does the Scriptural scholar discipline himself. So stated, therefore, not one of these statements can be called a scientific question—they are distinctively theological. But some scientists view these cooperative actions of God as "intrusions" into the ordinary working of natural laws. They see God's role in the unfolding of nature as miraculous, and this is not true. "God's providence, guidance and powerful action by which His creation continues in existence are in accordance with natural laws, not opposed to them. God works through the laws He has fashioned for His creatures" (22:303). The laws in nature are the functioning laws of nature because it is in God's plan that nature should operate according to these laws. As Dobzhansky has put it so well, "Evolution is the method..."
whereby Creation is accomplished" (6:124). And then as Nogar precisely puts it, "God does not destroy nature with the operation of His grace. He perfects it" (22:304).

However, it is theologically certain that God had elevated humans to a higher level than any other creature due to the gift of a human soul. In giving a soul, it was necessary that God also provide humanity with a body apt and worthy as the vessel or instrument for the soul. Thus humankind's dignity is above other animals. It's body, to the theological mind, was fashioned to serve a spiritual soul, for it is not merely a primate body into which the soul has been infused. How He accomplished this, whether immediately or mediately, is widely debated. But, however it was accomplished, this elevation of the human body must have been in harmony with the laws of nature. It is only reasonable to assume it completed the biological pattern of evolution and did not disturb it.

The scientist, therefore, approaches the issue from the paleontological record; the theologian from the necessary inference of moral and religious truths. Notice that not one of the truths stated by one field can be called into question by the other. Religious truths cannot be dissected by scientific prehistory; biological science cannot be examined and analyzed by moral truths. Biology takes the human species as it finds it, endowed with intelligence and freedom of spirit. Theology discusses the action of God in human origins because it pursues the moral and religious destiny
of mankind. In short, science and theology should not be at odds with each other.

But disagreements do occur, and this is good if not healthy. For it is in debating that some form of growth takes place. But one must be careful to keep in mind an absolute requirement in any question, whether asked by the theologian or the evolutionary scientist. That is, the "canon of professional respect" (22:308). All too frequently, the scientist and the theologian do not take each other seriously enough, that is to say, they regard the other's pursuits in an unprofessional manner. Theologians who refuse to acquaint themselves with the great advances taken place in science create confusion, misunderstandings, and harsh feelings. The same result is generated by the evolutionists who regard as unintelligent and unproductive the concern of Christian theologians for a reasonable reconciliation of the Genesis account of origins with the scientific data on the issue. Both sides would be wiser to realize science helps to found theology and Christianity finds a powerful ally in science.

As can be seen in the past twenty-five years of evolutionary research with its accent upon trends, tempo, direction, progress, and mode of evolution, the philosopher of science has been able to acquire new insights into the existence of God. Evolution, far from excluding a supreme Being, argues to the existence of God and His continued governance. The argument by Nogar is: "God exists and, through His causality,
His concurrence in natural activity, His governance and providence, He is necessarily involved in the universe. In short, His existence and invisible attributes are clearly seen, being understood through the things that are made" (22:309). And formulated in another way, the debate can be stated as: in the evolutionary progress and continuing in the present, we find that all diverse things and processes come together and integrate themselves under one order. This is not by choice but for the most part, if not always, occurs. Therefore, there must be some being by whose providence the world is governed. And this being we can call God.

So in science, as in any rational, intelligent discipline, humans have no other way to draw inferences than from their history or what they know best. It is from experience, be it personal or technical, that they find only one way to reconcile contrary processes as parts of one system, one order. Order is an infallible sign of wisdom. This is not to say that there is no waste, no error, no trial, no chance in nature, but that these discordant events are uniquely coordinated into a larger system which is organized. In the sense that chance systems are the beginning of the process from which order emerges, one can say that the order that exists in nature had its foundings in the disorder of chance.

This is one of the most striking conclusions from studies in evolution, that is, the manifestation of a marvelous 'orderliness' of diverging processes in organic prehistory. One cannot underestimate the orderliness nor the divergence of evolution. This whole process has order.
Evolution is not a purely random process. It may be unpredictable, but not chaotic. Theological scholars would go one step further. They would say that men and women stand as perfect creatures because of their rational, free natures. They are at the pinnacle of evolution. Biologists are more cautious. They say humanity has not been in existence long enough, nor shown its full adaptive powers, and therefore settling on one criterion of progress in the evolutionary story is not determinable at this point. However, they might go so far as to say that at this level of the process, humans stand at the forefront; but they may regress or be passed up by some other creature. But, one cannot argue the point that the evolution of living things has already moved in the direction of the more specialized, more complicated forms. This is the status of humans at present.

But one cannot automatically have design and arrangement and order as the product of chance systems. There must exist, too, the guidance and governance of an intelligence. These laws of order are unthinkable without a Designer, a Lawgiver, a providential Governor. And this is where evolutionary science can add another dimension to the natural order of the universe and at the same time support theological dogma. No longer can one be content with the static order of Newton, where the Creator brought the universe into existence and then simply tends it to maintain the status quo. The original order of the universe is no longer observable; it has been replaced by a new form of order. "Order succeeds order, and in a most orderly way" (22:316). If
the existence of God was necessary to the old conception of the order of nature, how much more crucial this existence must be to the present notion of evolutionary order! But, again, this activity of God is not an intrusion upon nature's laws. He does not intervene, but keeps nature in being through the natural workings of nature. "The working of the law of nature is the working of the design and will of God." (22:316). To see the action of God as a constant flickering of miracles would obviously be faulty theology; but more importantly to the issue, it would be a faulty view of nature and destructive of science.

Nogar states:

Evolutionary man, as animal, has no ethics, no special destiny. Evolutionary man, as man, has a special destiny, but only a partial perspective in achieving it. Evolutionary man, as man related to man and God, has not only a special destiny, he has the total perspective from which to muster intelligent, free and energetic action. Without God, man can in no way be fully free and intelligent in shaping his destiny. Human action without account of the Creator and Designer and Governor of nature and its evolution can neither be free, energetic, nor intelligent (22:319).

And Dobzhansky reiterates: "Man's future destiny will not be achieved unless he be fully human, full intelligent and free." (9:132).

Part of being fully human, intelligent, and free -- if we say that God created all things -- is to insist that creationism cannot be assumed to be correct. One can disregard this view as the proper mode of evolution and still maintain that God is the Creator of all. Revelation still guarantees the affirmation that God is Creator, no matter
the time or manner of creation. The author of Genesis could not have had any special revelation about the precise beginnings of the world because this is not the way God works in and through our lives. The author simply showed the pre-scientific views of his culture and time, and that is all. There was a marvelous style of communication between God and the author, but the latter did not receive any new body of information never revealed before. But God did lead the author to understand that nothing existed which had not been created by God, and that as they were created, all things were good.

However, there are those who will assert that geology and paleontology still have gaps in their knowledge of human origins. Quite correct; they have done their homework. But they miss the point that the evolutionary theory springing from the above two sciences still provides a much more sophisticated and substantiated view than that interpreted from Genesis. Yet this is only to be expected, for they are threatened and placed on the defensive by every new discovery that supports the evolutionary picture. They simply need to be more open and realistic to the facts of science and the help offered by science. This is not to say that scientists should be allowed to dogmatize theological issues that lie outside the realm of their competency; yet on the other hand religious people should not continually battle against the properly proven, scientific observations. Both sides should relax and accept that applicable scientific discoveries constitute no challenge to the concept that God
was behind whatever it was that happened. It is not a sin to compromise with science. Christianity has been doing it since Plato's and Aristotle's day with respect to physical sciences, sociology, medicine, and philosophy.

I wish to conclude with two important points. Biological science and all its associated fields are not substitutes for faith. One is a Christian through Christian faith and not because of his scientific views on evolution or the rationale he uses to fit God succinctly into the picture. This is a credible viewpoint, one I feel is the most appropriate. But there are many Christian believers who may not be open to, interested in, or convinced by the arguments and facts of evolutionary research. This, I believe, is perfectly legitimate, too. But there is the second point I wish to make, and I think E. Schillebeeck presents it quite well, at least better than I could. He states, as the domain of scientific phenomena became enlarged,

\[\text{theology had to retreat more and more, first relinquishing the cosmos, then the world of evolution, then society and the depth dimension of human behavior. By giving up phenomena, theology lost almost everything . . . No one seemed to realize that the sciences form a part of our developing history, a subdivision of the story of mankind. In any case, theology cut itself off from these sciences. By this dissociation from the empirical sciences, theology became marginalized; it was isolated from concrete history in which it had always discovered God's saving activity . . . Theology finds its identity not alongside or above the other sciences, but in and through them. Like the gospel, theology must exist for the other sciences as well as for itself (35:493).}\]
BIBLIOGRAPHY


