A CHRISTIAN PERSPECTIVE ON CHORDATE MORPHOLOGY

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Structure and function are intimately related, because they are rooted in the structural order of creation. Embryology and anatomy are both based on a basic structural and functional plan. How one interprets the morphologic data is determined by one's basic life commitment. Anatomic and embryologic data can be interpreted from the evolutionistic point of view, but the creationist's explanation provides an alternative which is consistent both with the confession that Jehovah is God, and with the world structure around him. Examination of phenomena such as pharyngeal pouches, kidneys, human tails and homology of organs provide a clear confirmation for biblical creationism.

Introduction

Chordate morphology is a broad study which is concerned with a number of aspects of the form and structure of those animals which have a backbone. Although histology, cytology, pathology, neurology and histochemistry are integral parts of morphology, only gross anatomy, comparative anatomy and embryology will be considered in this paper.

By abstracting certain structural aspects of the whole organism, a student of anatomy (G. *anatemnein,* to cut up) examines the structural composition of the body of an animal or man, at both gross and microscopic levels, while a student of embryology (G. *embryon,* embryo) analyzes development of an individual organism from conception through birth, and thus seeks to establish why and how parts of the body come to be arranged as they are.

Structure, Function are Intimately Related

It is generally recognized that a study of structure of animals and man is inseparable from consideration of the function of parts concerned. The function of an organ or part cannot be understood if its structure is not understood, while structural composition cannot be truly meaningful without understanding function. In other words, the two dynamic aspects, of structure and function, though distinguishable, are inseparable.

This close relationship between structure and function is based on the created structural order.[1] This is also demonstrated by the fact that an organism is not merely the sum of its parts. Each part, however, must be understood in the light of the totality of the organism, which is modally qualified by its biotic function.

Morphology Based on Structural Plan

All vertebrates share a fundamental morphological pattern and therefore resemble each other at least superficially, as, e.g., in the general distinction of the body into head, trunk and appendages. In this we recognize the presence of a basic plan according to which these animals are built, and as a consequence of which we expect to find, and actually do find, a number of variations.

Gregory, although whole-heartedly dedicated to Evolutionism, speaks of "convincing evidence of the anatomical unity of the entire vertebrate series from shark to man," and again of a "manifestation of a morphological theme that has a thousand variations."[2] Romer also realizes this when he says, "Even in the early days of zoologic research it was recognized that within each major animal group there was a common basic pattern in the anatomic plan of the body."[3]

Anatomy Linked with Embryology

Studies of anatomy and of embryology are very closely allied in the sense that embryonic development of organs of an individual explains many conditions and relationships of these organs in the adult organism. Or in other words, embryology is a basis for the understanding of mature structures as they are encountered in the study of anatomy.

Ballard says that "a common basic plan of anatomy exists in all vertebrate embryos," and shows "how the processes of early embryology make sense in terms of this basic structural pattern." He also recognizes that similarities which we observe among the different vertebrate groups are based on variations of this basic plan when he says, "The anatomies of adult vertebrates are shown to differ as the result of trends discoverable in comparative embryology. Their similarities are traced to the common heritage of a basic design."[4]

Romer, too, recognizes that "within each major animal group there [is] a common basic pattern in the anatomic plan of the body," and that "any identity between homologies is based upon the identity or similarity of the developmental processes which produce them."[5]

Perspective on Morphology

Determined by life commitment

Underlying the study of morphology is a vast array of structural and functional similarities and dissimilarities on the basis of which animals are placed in certain taxonomic categories. However, not all biologists have the same interpre-

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tation of these data. Many modern biologists insist on interpreting all data of science from the premise that "organic evolution is . . . an unshakable fact."[6]

Acceptance of this premise is not merely an acknowledgement of a theory, involving only some matters regarding biological detail, and disclaiming any religious or metaphysical presuppositions. It is also a life commitment, an all-encompassing world-and-life view, which determines the outlook on every facet of life. Simpson and Beck show this clearly when they say, "The most general principle of all in biology is evolution. We have tried to make evolution as pervasive as it really is in the world of life. Every topic has its evolutionary background and aspects."[7]

Or, as Romer says, "One cannot make a comparative study of the vertebrates without formulating some general concept of the nature of evolutionary processes."[8]

The reader should understand clearly that Evolutionism is an all-pervasive dogma to which its followers are committed, not on the basis of facts, but as a matter of faith and heart commitment.

Whereas the study of vertebrate morphology is based on observed phenomena and is rooted in the created structures, and not in the mind of man, Ballard says,

> The unique and priceless part of science is what comes out of the mind and has no material existence at all. Facts there become linked in significant relationships, and these are expressed in generalizations and abstract concepts. An edifice of internally consistent theory is constructed out of the abstractions, which makes a new sort of sense out of all the observed facts, At this stage there may finally emerge, almost miraculously, the power of prediction and control, which justifies the whole mental effort.[9]

Ballard fails to recognize, however, that our minds can only recognize orderly structure which is already present and that all generalizations and abstract concepts must be based on structures present in the subject of study. What really gives meaning to observed facts is that all aspects of reality are bound together in a coherent structure which unfolds itself subject to the Law set by the Creator.[10]

Antithesis evident in morphology

The antithesis between the Christian and the evolutionary position shows clearly, also in morphology, if we recognize that our evaluations, interpretations and perspective, which are determined by our previous heart commitment, have a determining influence on all our scientific activity. That is, our heart commitment will determine whether we interpret all natural phenomena in the light of either the Biblical principle of creation by God, or the apostate theory of evolution.

The difference between Christian and non-christian views of morphology also clearly bears out that our basic commitments in life have very much to do with how we interpret the data and in which perspective we see the natural phenomena. Smith says,

> The "whole" that renders comparative anatomy greater than the sum of its parts is the pattern and meaning of evolution. However approached, comparative anatomy is in the end a study of the changes wrought in the chordate body with the passage of time, and an analysis of the significance of those changes.[11]

Obviously he sees all this in the light of his pre-scientific commitment to the theory of evolution.

That observable phenomena are placed in a preferred framework of thinking consciously and intentionally can be seen by such revealing statements as made by L. Hyman: "I have included in the manual such materials as seemed to me to bear most directly on the story of the evolution of the various systems."[12] And,

> I have also presented in connection with each system a very brief, generalized, and simplified account of the development and evolution of that system. It has seemed to me essential that such an account precede or accompany the laboratory directions in order to give a significance to the facts revealed by the dissection at the time when the student becomes aware of those facts.[13]

Yet the Christian perspective on these same observable phenomena is radically different from the non-Christian, but is not therefore unscientific. Christian biologists observe the same structural phenomena, and they have God's Word to direct them in giving meaning to all these phenomena.

Christian biologists know from Scripture, and accept by faith, that God created all animals, and that He still upholds them. Christian biologists see many similarities among different groups of animals, and through these recognize the basic pattern by which God makes animals to develop embryologically. And Christian biologists see this same basic structural plan fulfilled in adult organisms.

Rather than being led to think that similarity indicates a genetic evolutionary relationship between different groups of animals, the Christian recognizes the basic plan by which God makes all creatures to develop in their life time according to the laws He created for them, and we acknowledge Jehovah God to be the Designer of this plan.

The creationist position is often ridiculed by apostate scientists[14] but it can be shown very clearly that this position is more tenable, is more in accordance with the actual phenomena, and leaves one with fewer antinomies and insoluble problems than the evolutionist position.

Homology

This advantage of the creationist position can be clearly demonstrated in the difference in perspective on one of the most fundamental concepts in comparative morphology, namely that of homology. Parts of animals are homologous when their anatomical structure and relations to other body parts are similar and when they have developed by similar processes from similar embryonic origin.

A classic example of homology is that of the arm of man, the wing of a bird, and the front leg of a horse, each of which develops similarly in the embryo, and in the adult stage has a number of bones, muscles, nerves, etc., which show great similarity in position and in structural detail. Although the functions of these forelimbs are quite variable, i.e., for fine manipulation, for flight, and for running, respectively, they are said to be homologies because they meet the above requirements.

Although recognition of these phenomena of the created world structure is quite universal, the perspective in which they are seen is very strongly colored by the basic commitment of the individual scientist.

Non-Christian perspective

Ballard, while agreeing with the above definition of homology, says,

> The contemporary zoologist is ready to suppose that the homology is a product of divergent evolutionary trends from a structure in a common ancestor, and in exceptional cases he may see a direct confirmation of this in a sequence of fossils.[15]

This supposition, of course, is not based on the observed similarities, but is meant to give meaning to these similarities. But this meaning can be derived only from one's basic beliefs and broadest life experience. That Ballard is not unaware of this is evident when he says,

> The entire science of vertebrate morphology rests on the concept of homology. It is an interesting situation therefore that this concept resists a strict definition in any known terms, and the detection of homologies involves some subjective elements of personal decision and some frankly insoluble problems.[16]

This coloration by basic commitment is more obvious when Romer says,

> With the acceptance by biologists of the principle of evolution in the 60's and 70's of the last century, real significance was given to the concept of homology: the thesis that specific organs of living members of an animal group have descended, albeit with modification, slight or marked, from basically identical organs present in their common ancestor,

while he realizes that "any identity between homologies is based upon the identity or similarity of the developmental processes which produce them."[17]

Whereas Romer sees that homology is rooted in the structural order of the organisms, Simpson and Beck seek the cause for homology in genetic relationship: "Homology is correspondence between structures of different organisms due to their inheritance of these structures from the same ancestry."[18]

Still more dogmatic than the above is L. Hyman in her assertion that

> the concepts of *homology* and *analogy* . . . are understandable only in terms of the principle of evolution. Homology is intrinsic similarity indicative of a common evolutionary origin.[19]

Although most authors are committed to Evolutionism in their interpretation of data, they are unable to deny that the real substance of comparative morphology is based on the observed structural order.[20]

Implications of this view of homology on taxonomy will now become evident. In taxonomy there are two basic ways of making use of the principle of homology in classifying the vast array of different animals. The evolutionistic assumption is that the structural and developmental similarities between groups of animals are an indication of the genetic relationship through descent from a common ancestor, indicated by the term *phylogeny*.

Ballard says, "The members are considered to be relatives of each other because they possess in common certain structural features and developmental stages not shared by animals of other phyla."[21] And again he says," All modern systems of classification of vertebrates incorporate the conclusion that biological evolution has taken place."[22]

Hyman, too, thinks, "that all animals are related to each other by descent and have become differentiated into distinct groups only through a gradual process of change."[23] Simpson and Beck put the cart before the horse when they say, "Modern systematics has learned that they have the same anatomical pattern because they belong to the same biological evolutionary population or group of populations."[24] At the same time, however, they hold that, "Homology is the anatomical evidence for degrees of relationship among organisms."[25]

Christian perspective

When Christian biologists look at the animal kingdom they do not see the animals as genetically related through common descent but as created according to a basic plan, with a rich variety in which each animal is suited best for its peculiar environment. Because Christian biologists know that each animal group has been created after its kind,[26] the concept of phylogeny, which is a necessary corollary for the evolutionist, has no place in the views of Christian biology. Therefore, in the Christian perspective, in taxonomy classification of animals should be on the basis of their structural and functional similarities, much as Linnaeus saw it, and correctly so, in the 18th century. Such a classification will be rooted in the structure of creation, rather than be dependent on some concept which is the product of theorizing.

Recapitulation Theory

Apostate foundation

In the study of embryology we find that some of the same problems and basic attitudes are encountered. At the basis of much modern embryologic thinking is the theory of recapitulation, sometimes called the biogenetic law of Muller-Haeckel,[27] which is often expressed in the epitome, "ontogeny recapitulates phylogeny."

The intent of this theory has been that "an individual in the course of its development passes through successive stages that approximate the series of adult ancestors from which it descended."[28] Many have seen that this is an untenable position. Arey concisely puts it as follows, "this doctrine goes beyond the facts."[29] Rugh goes further, and says that there are "innumerable exceptions to the general law of recapitulation."[30]

Patten modifies the above theory to state, "In essence the law is that an animal in its individual development passes through a series of constructive stages like those in the evolutionary development of the race to which it belongs."[31] Admitting its limitations, he tries to salvage the theory by saying that "if the biogenetic law is broadly interpreted, with due recognition of innovations and modifications, it is still valid and can be of great help in understanding both embryology and comparative anatomy."[32]

Simpson and Beck say, "It is now firmly established that ontogeny does *not* repeat phylogeny. Ontogeny repeats ontogeny, with variations." But they add, "Phylogeny is a series of ontogenies. What is passed on from one generation to the next is a developmental mechanism. It is also the developmental mechanism that evolves."[33]

Use of homology

Many so-called evidences are adduced in an attempt to strengthen the unifying theory of recapitulation, and much emphasis is given to the evolutionistic concept of homology, i.e., of similarity in structure and similarity in embryonic origin and development because of descent from a common ancestor. For example, the human "tail," the pharyngeal pouches (often called gill pouches), and the kidneys are said to be proof of phylogeny on the basis of homology. Patten says,

> It is interesting that at this stage the human embryo has every bit as well developed a tail as the pig. The tail in our own later development normally undergoes regressive changes that leave us with only our symbolic coccyx. Occasionally, to the discomfiture of anti-evolutionists, this regression fails to occur and a human infant is born with a sizable and unmistakable tail.[34]

And in regard to the pharyngeal pouches, Balinsky says, "their formation can only be explained as an indication that the terrestrial vertebrates have been derived from aquatic forms with functional gills.''[35]

Ballard points out that

> Many elementary biology texts perpetuate an idea from the previous century, that the earliest vertebrates had only a pronephros, which now appears fleetingly in the embryos of all modern species but only remains functional in very primitive fishes; that there then evolved a mesonephros which superseded the pronephros in the modern forms and remains the adult kidney of present-day fishes and amphibia; and that finally there evolved a metanephros in the amniotes, which supersedes the mesonephros, the latter having been relegated to the minor function of a fetal kidney. This simple theory acquired its popularity at a time when embryological investigations, particularly of the anamniote groups, were not far advanced.[36]

Proves unsatisfactory

These examples show that the concept of homology is used in the context of evolutionistic principles in order to explain the above mentioned phenomena. That this attempt proves unsatisfactory is indicated when Ballard says further,

> The detailed record now shows that most if not all vertebrates have continuous kidney strips in which waves of differentiation and change of pattern occur. Time gaps and space gaps sometimes make convenient the description of particular sections as pro-, meso-, and metanephros, but often they allow other di-

> visions. There are no phylum-wide diagnostic criteria that can define a pronephros, or a mesonephros, or a metanephros, though such definitions can usually be written for a species or an order or a class. Functional differences between kidneys may or may not be correlated with these subdivisions, and may occur between two kidneys which would be assigned to the same morphological category. There is not yet any adequate theory of the evolution of the vertebrate urinary system.[37]

Rugh says, "The repetition of structures in various embryos indicates, then, the essential natures of the particular structures rather than necessarily a recapitulation of ancestral development." And again he says, "Modern embryology recognizes the similarities during early development. Whether these are circumstantial evidence of recapitulation or repetition is debatable."[38]

Better account available

Arey shows that an embryologic explanation other than the evolutionistic explains the human "tail" very well:

> The embryonic tail is at its relative maximum at the end of the fifth week when it is one-sixth the length of the embryo. During the succeeding four weeks it disappears from external view, partly through actual regression; moreover, the coccyx, which represents the remnant of a tail, recedes to a higher position in relation to the buttocks.
>
> The embryonic tail has been known to persist and grow. Specimens as long as 3 inches have been recorded in the newborn, and one was reported to have become 9 inches long at 12 years. Most of these tails are soft and fleshy but a few have contained skeletal elements. Some tumors of the coccygeal region are attributed to the abnormal activity of residual primitive-knot tissue (the end bud).[39]

Creationist alternative

If, then, the evolutionistic explanation of these observed phenomena is inadequate, do creationists have a better explanation? My contention is for the affirmative.

We need to recall the recognition of the basic plan which we discover in the development of most of the vertebrates. God has made all Vertebrata to perpetuate from generation to generation by means of the zygote, i.e., the single cell resulting from the union of the male and female gamates of the parents.

Each zygote must progress from the single-celled stage to the many-celled stage by means of cell division. This cell division occurs according to the structural laws which are part of the created structure of the individual, and these structural laws, with possible variations, hold for all vertebrates.

Not only must the individual achieve the many-celled stage, but he must also differentiate into a particular individual which is basically the same as its parents. This process of differentiation tends to make the embryos of individuals from different taxonomic groups increasingly more different as they progress in their ontogeny (i.e., in their individual life development) toward the definitive adult form. This was already clearly recognized by K. E. von Baer in 1829. Unfortunately, his work has been obscured by Haeckel, who superimposed the evolutionistic presuppositions upon von Baer's findings. (Editor's note: Readers will find documentation of this point in *Creation Research Society Annual, 1969*, "Ontogeny Recapitulates Phylogeny" by Wilbert H. Rusch, Sr., pp. 27-34.)

When we compare, then, embryos of different species at different stages of development, we find that they change from the nearly identical initial stages, in which they consist of one or a few cells, to successive stages in which their appearance increasingly diverges and during which they increasingly take on the specific features of the definitive adult organism.

When we find, therefore, that the chick embryo at first develops a pronephros, which remains nonfunctional in terms of excretory function, we are not surprised to see that the pronephros does have a very definite function of a different nature. It has been clearly established that if the pronephros is experimentally prevented from developing, further development of the mesonephros and metanephros can not ensue, thus indicating the essential nature of the presence of the pronephros in the development of the normal kidney.[40]

By the same token, the antievolutionist need not be discomfited by the appearance of a tail during the 6 mm. stage of the development of the human embryo. We readily grant the resemblance to the pig tail at a corresponding stage, but we cannot see any necessity at all to conclude on this basis that therefore the one must be descended from the other.

As Arey indicates,[41] the appearance of the human "tail" is merely due to the fact that during the fifth week of development the vertebral column is at a more advanced growth stage than the surrounding tissues, and that as these other tissues develop, the tail bone is resorbed so that it is no longer very noticeable. This process is normal and must take place for normal development of that part of the body to occur. Inductors, cellular environment and genes are among the factors which are responsible for

regulation of this development. Consequently, if something goes slightly wrong at an early stage of development, anomalies may be expected, and they occur in many other parts of the body (just think of the limbless thalidomide babies).

Pharyngeal pouches are structures which are present in all vertebrates during early stages of development. In fish these pouches subsequently develop into respiratory organs of the adult fish, *i.e.*, the gills. In the embryos of reptiles, birds and mammals, however, these pouches do not develop into any structures resembling gills at all, but develop into organs which are structurally, as well as functionally, completely different from gills. Nor do these pouches in most cases become connected with the outside as gill slits of fish do. In the few instances where the branchial plate does perforate (as it does quite often in the first three pairs in the chick[42]), the opening to the outside promptly closes again.[43]

The presence of pharyngeal pouches during early developmental stages is essential for normal development, since in their absence a number of adult structures fail to develop. Ordinarily, the first pair of pharyngeal pouches develop into the middle-ear cavity and the Eustachian tube, the branchial plate forming the tympanic membrane. The second pair of pouches develops into the tonsils. The third and fourth pairs of pouches give rise to the parathyroid glands and the thymus gland, and also to the postbranchial bodies which become imbedded in the thyroid gland.

Thus it is clear that pharyngeal pouches do not constitute any so-called proof for evolution, but confirm the theory, based on Biblical revelation, that a basic plan is used by God in which he makes use of similar embryonic structures which develop into various different adult structures, according to the structural laws which guide their development.

Conclusion

The Evolutionist tries hard to be consistent in his work with his basic starting point that there is no God. The Christian, on the other hand, starts with the confession that Jehovah is God, and then tries to explain the world in a way which is consistent both with this confession and with the world structure around him. We need not feel compelled to take over any part of the evolutionistic interpretation of data obtained. Should the creationist accept evolution as a fact because he feels that he is forced to do so in order to retain scientific respectability, he will someday find himself in the predicament of finally having accepted a theory which the unbeliever must eventually discard for lack of scientific evidence.

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[13]*Ibid.,* p. v.
[14]The entire book of Gregory *(Op. cit.)* is permeated with ridicule. See also Simpson and Beck, *Op. cit.,* p. 491, where the theistic approach of Linnaeus is criticized from the viewpoint of modern evolutionism.
[15]Ballard, *Op. cit.,* p. 43.
[16]*Ibid.,* p. 45.
[17]Romer, *Op. cit.,* p. 9.
[18]Simpson and Beck, *Op. cit.,* p. 494.
[19]Hyman, *Op. cit.,* pp. 3-4.
[20]Cf., *e.g.,* Ballard, *Op. cit.,* p. 43; also Simpson and Beck, *Op. cit.,* p. 495.
[21]Ballard, *Op. cit.,* p. 23.
[22]*Ibid.,* p. 38.
[23]Hyman, *Op. cit.,* p. 5.
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