

The Confluence of Philosophy And Biology: An Excavation of Philosophical Issues in Molecular and Developmental Biology

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ABSTRACT

Philosophical evaluations have played an influential role in the growth and development of molecular and developmental biology to ensure that every individual is born healthy, born wanted, and has the privilege to fulfil his or her potentials for a life free from disease and disability. This is why it becomes necessary for biologists to carefully understand human genes, evolution, cells and general human anatomy to fulfil this project. During this process, they are faced with challenges where they also lack the foundation on how to solve them. This challenge gave birth to a philosophical excavation of molecular and developmental biology. This paper is an attempt to expose that philosophy is a major tool in proffering possible solutions to issues related to biology through one of the new dimensions in philosophy, namely philosophy of biology. It is one of the most exciting new areas in the field of philosophy which is attracting much attention in the contemporary philosophical studies. In this paper, we posit that issues in molecular and developmental biology will be of success when the fundamental tools of philosophy are being taken into consideration cognizant that philosophy and biology viz-a-viz philosophy of biology, can be seen as a single inquiry into the nature of man-well-being.

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INTRODUCTION

The topic “The confluence of Philosophy and Biology: An excavation of philosophical issues in molecular and developmental biology” deals with an evaluation from a philosophical approach on issues related to the assumptions and presuppositions of molecular and developmental biology through one of the dimensions of philosophy called Philosophy of Biology.

Philosophy of Biology is one of the most thought provoking areas in the field of philosophy of science and one that is attracting many contributions from both philosophers and scientists. Because of its exciting nature, many researchers are dedicated to making positive contributions to the growth and development of biological studies. In the study of biology great philosophers like Aristotle, Immanuel Kant, Charles Darwin and Herbert Spencer have contributed immensely in shaping and developing the course. In the nineteenth century, the works of Charles Darwin (1959) gave biology a modern and great evolutionary approach as expounded in his book “*On the Origin of Species*”; also the works of James Watson and Francis Crick on “Molecular Biology” were all monumental in twentieth century. In twenty-first century biology, the discovery of DNA in genetic engineering, the AIDS epidemic, the practice of parabiosis, the human genome project, human cloning, germ-line modifications, harvesting of body tissues, foetal neural transplantation, tattoo making, breast implants, breast ironing, sperm cell transplants, cryonics, tongue splitting, female genital cutting, In-vitro fertilization, artificial womb, artificial insemination, surrogacy, sperm and eggs donation, contraception, euthanasia are all monumental breakthrough in biological studies. The effects on man, arising from these studies are pertinent.

In view of the above paradigm shift in biological studies, many, ethical, epistemological, metaphysical challenges have been observed; thus, there is need for philosophical evaluations. It is within this frame of reasoning that the topic: “The confluence of philosophy and Biology: An excavation of philosophical issues in molecular and developmental biology” is examined.

What Is Philosophy of Biology?

Etymologically, philosophy is derived from two Greek words “Philo” and “Sophia” meaning love and wisdom. This etymological status of philosophy translates into love of wisdom. It is the love of wisdom that goads philosophers to examine the theories and postulations of biological sciences (Mendie, 2015). Thus, for the purpose of this work, we define philosophy as the critical evaluation of human activities as it concerns the well-being of man, its nature of existence and how to cope with the various challenges for an equipped, sustainable existence from the bearings of logic, criticality and analysis of fact about reality.

Biology in a more simple term is an aspect of natural science concerned with the study of life and living organisms, including their structure, growth, evolution, distribution and taxonomy. In general, biology recognizes the cell as the basic unit of life, genes as the basic unit of heredity and evolution as the engine that propels the synthesis and creation of new species.

In view of the above, let us consider the following philosophical questions that may puzzle our mind in the study of biological science. What is life? What is the true origin of man? Does a molecule exist? Is there any connection between life and a molecule? Is DNA cloning a moral act? What is an embryo? Does an embryo exist? What makes man uniquely human? What is a species? What is adaptation? Can we really adapt to the environment? What is the basis of cell existence? Is evolution possible? Can biology study adequately reveal the personhood of man? These are some of the questions on which biologists cannot proffer adequate explanation, but an insightful evaluation can be found in philosophy. Thus, the application of philosophical tools to the assumptions and presumptions of biological practices is what we called philosophy of biology. It should be noted that the central concept in biology is that life gives meaning to man’s existence, which promptly questions the essence of man. The issue is nagging in philosophical studies. A philosopher may not be a biologist but could understand the fundamental assumptions and presuppositions of biological science. At this juncture, it is pertinent to examine the divisions of philosophy of biology.

Divisions of Philosophy of Biology

Biology as a science scrutinizes various aspects of life which facilitate an in-depth study of organisms and other entities that have life. This extends and pervades various frames ranging from terrestrial through aquatic, aerial and molecular levels. Consequently upon this, we have the following shades:

- Philosophy of evolutionary biology
- Philosophy of systematic biology
- Philosophy of molecular biology
- Philosophy of developmental biology
- Philosophy of ecology and conservation biology

However, for the purpose of this paper, our quest shall be on the philosophy of molecular developmental biology and evolutionary biology.

The Discourse on Molecular and Developmental Biology and Evolutionary Biology”

According to J.M.W. Slack (2006), developmental biology occupies a pivotal position in modern biology. This is because it unites the disciplines of molecular biology, cell biology, genetics and morphology. Molecular and cell biology examine how the individual’s component works, namely the inducing factors, their receptors, the signal transduction pathways, the transcription factors. Molecular biology here is seen as the study of biological functions at the molecular level. Genetics, however, tells us directly about the function of an individual gene and how it relates to the activities of the gene. Morphology, or anatomical structure, is both a consequence and a cause of the molecular events (3).

In view of the above, developmental biology is a synthetic discipline in which an understanding of molecular biology, genetics and morphology is necessary. Developmental

biology, in this respect is necessary to use concepts from these three areas simultaneously because they are all necessary to achieve a complete picture (Slack, 2006).

According to Eunice Kennedy Shriver, Developmental Biology is defined as understanding normal and abnormal development consisting of the basic and biological science necessary to understand early development in utero and through time when many organ systems form (2). In Shriver's definition, it pictures developmental biology as the study of the processes through which an organism forms from zygote to a full structure. It spans through embryology, which is the study of the development of embryo from fecundation (point of fertilization) to birth.

It should be an interest to note that developmental biology as conceived by Shriver cannot be explained only biologically even when one relies on the cellular basis of development of persons and life. The issue of atoms, ions, isotopes, electron raises epistemological and metaphysical which can only be resolved by the application of philosophical dictate. It is at this juncture that philosophy of biology becomes pertinent to adequately examine developmental and molecular biology. Basic issues which fall under two compartments are given pre-examination. These are placed under:

- The Traditional issues
- The Contemporary issues

The Traditional Issues

These are language problems arising from the definition and explanation of biological concepts. In this process, ambiguities and contradiction are obvious especially when questions are raised concerning these concepts. These traditional issues include the following:

- **Issues on the definition of Gene**

In molecular and developmental biology the issue regarding the definition of gene is central in this discourse. According to Machamer (2002), there are a lot of controversies about the definition of genes in development and evolution. The concern of philosophers of biology is not over the right definition but controversies created by biologists whether genes so defined can bear the theoretical weight placed upon them (263).

The concise oxford English Dictionary (2013) defines gene as:

“A unit of heredity which is transferred from a parent to offspring and is held to determine some characteristics of the offspring, in particular, a distinct sequence of DNA forming part of a chromosome.”

This chromosome carries genetic information in the form of genes which shows through human phenotype. Phenotype on the other hand is the observable characteristics of an individual resulting from the interaction of its genotype with the environment. Genotype here is the genetic constitution of an individual organism (gene). Paul Griffiths (2002), comments becomes pertinent thus:

“In the philosophy of developmental and molecular biology, however, the central issue has been to the relationship between gene and phenotypes. The classical molecular gene concept, which emerged in the 1960s and is still orthodox in textbook presentations of genetics, defines a gene as a stretch of DNA that expresses particular polypeptide via transcription and translation. This identifies an individual gene by a particular, minimal ‘phenotype’ to which it gives rise (264).

These competing definitions of gene and competing account of the role of the gene as a developmental cause have given birth to a result of doubt in biology.

In view of the above, the multiple functions of genes make it difficult to identify the place of gene in human life. Gene plays a role in molecular biology through the structure of organism and in developmental biology it involves in developmental signalling (Mornage,2000). The issue here is that gene is seen in different context as in developmental gene, structural gene which has raised a lot of criticism in modern biology, giving rise to questions like, Is gene real? Or does it exist? What is the empirical factor of gene? What level of existence can be known?

Answers to these questions would surely show the limitation of molecular and developmental biology.

Issues on Definition and Origin of Species

The definition and origin of species is another central issue in molecular and developmental biology that has been subjected to various scrutiny and philosophical debates. In molecular and developmental biology, the word “species” plays a vital role on how to trace the origin of organism. Charles Darwin’s Theory of Natural Selection as posited in his book “*The Origin of Species*, 1959” refers to species as ‘arbitrarily given for the sake of convenience’ (52). This is because species are seen in two conceptual contrasting ways, species as in a “category” and species in “varieties” dealing with the individual differences. Prior to Darwin, Carl Von Linner, who is popularly called Linnaeus, an 18th century naturalist patterned a link in the chain of Being. He explained that species were unique and unchanging kinds of organisms, each locked in place in the chain of Being (Starr & Taggart, 24).

In view of the above, it has been observed that species can be seen as an ontological nature of organism and also as a criterion used to determine the class of organism. This has made the word species much less precise in the study of molecular and developmental biology, making it impossible to be an organized effort in tracing *where we came from* and *where we are going to*.

- **The Issue of Developmental Constraints, Evolution and Adaptation**

Is evolution possible? Is it a fiction? If it is possible or it exists, what is the cause of evolution? What is the development structure of organisms? Is it possible for man to adapt to his environment? How can we be assured that organisms are adaptive to their environments? Why is death possible? Is the problem of adaptation the cause of death? Why do creatures exist here and not there? These are some of the thought-provoking questions philosophers of biology do ask considering the theories that support evolution, adaptation, selection and development of organisms in a particular ecosystem.

Evolution, according to Charles Darwin, is seen as the process by which different kinds of living organisms are believed to have developed from earlier forms, especially by natural selection.

This is why Paul Griffiths (2002) submits that:

“Traditional neo-Darwinian gradualism suggests that species evolve more or less continuously in response to local selection pressures. The fossil record, on the other hand, suggests that species remain largely unaltered for long periods of time, and undergo dramatic periods of rapid evolutionary change” (255).

In view of the above, it is an affirmative that evolution is possible. But why has it stopped? Or is nature still undergoing some unseen evolutionary changes? These are some of the unanswered questions yet to be evaluated by both biologists and philosophers of biology. In natural selection, one is trying to examine the questions, why do we have viviparous snakes but no viviparous lizard or birds? This has been explained using developmental constraints. Hence, the form that any organism takes is what developmental constraints tries to examine. What are developmental constraints? They are the factors that are being considered in any organism to exist and not to exist in a particular ecosystem.

The philosophical issue is who is the cause and controller of the constraints (Developmental constraints) during developmental biological processes. It is this developmental constraint that gives life to adaptation in biological studies which is unknown to present philosophers of biology. It is widely acceptable that the ability of natural selection to create complex adaptation depends on the ability to create those adaptations cumulatively, adding features one at a time (Machamer, 2002). This is why the aim of biology lies on giving factual explanation whether organisms are well adapted to their conditions of life or not. Thus, it has been observed over time that the adaptation processes of human beings and other organisms cannot accurately be explained by biologists. Hence, the question of true adaptation is yet to be answered. Thus, are we perfectly adapted to the environment? Empirically, it has not been proven because at some point, different organisms including man find it very hard and difficult to live and adapt to a particular environment.

Contemporary Issues in Molecular and Developmental Biology

These are issues that came up as a result of modern technological input in the practice of molecular and developmental biology. They also consist of current issues under debate which are all based on societal challenges in biological studies. They include as follows:

- **Issues In Genetic Engineering**

The advancement in molecular and developmental biology has paved the way for humans to control genetic character, intelligence and sex through genetic engineering. According to Nathaniel Centre of bioethics, genetic engineering is a technique, which can be used to move, delete, modify, manipulate or multiply genes within a living organism. It can also modify existing genes or construct new genes and incorporate them into another organism (genetic engineering, 1).

The studies of molecular and developmental biology expose the fact that every human body is made up of cells, and in every cell there is Deoxyribonucleic acid (DNA). DNA is the nucleic acid that carries the genetic information to the offspring of an organism. It forms the chemical basis of hereditary character. It also contains the institution for the synthesis of protein in the ribosome (Sembulingam et al, 2010). Gene is the part of DNA molecules, and DNA is present in the nucleus, and the nucleus exists in the cell, meaning in every cell there is a DNA. Gene is a portion of DNA molecules that contain the message or code for the synthesis protein from amino acids, and also it is the basic hereditary unit of the cell. In genetic engineering, when the possibility of changing one gene is positive, which when done may cause change in character, behavior and intelligence of the individual. Thus, it is possible to transfer one's character or behavior to another through genetic engineering or transfer. This has produced so many good results in that one can help to determine the sex, intelligence and character of another.

Genetic engineering has helped in the production of insulin, which helps in treating diabetic patients who lack insulin in their body and so, cannot process glucose (Ekeke, 2010)

These successes of genetic engineering have come along with its grave ethical problems:

- The practice of Eugenic which is done through genetic engineering has negative implications because in Eugenics, which is the science of producing healthy and fine offspring for cloning, bad offspring are discarded through this process. Hence, the culture of destroying life is being introduced. This should be checked and controlled. Life which is supposed to be protected is now destroyed.
- In genetic counselling there should be confidentiality of information gotten from the person going into genetic testing. As such, no one should be forced to go into this test by government. (Ekeke, 2010).
- Genetic abortion is another critical issue that needs urgent attention because it has to do with taking of human life present in any offspring.
- Genetic creatures are those beings that are created from the combination of several genes (clones), and as such it should highly be checked to avoid misused of DNA which are meant for research purposes and not to be used in creating super clones that will fight against man's will.

- **Issues Related To Sexual Behaviours**

Do genes make people gay? Or do genes make people sexually addicted? These are related questions molecular and developmental biologists hear all the time from the society whereby people claim they are born gay, and as such they deserve the right to marry their same sex. The issue is that since DNA can be transferred from one organism to another, in every DNA, there is a gene. Thus, the genes of every organism carry the weight, skin color, body structure, intelligence, and character of that organism. Then during genetic engineering such character or behaviour are transferred. In other words, if gene of A is transferred to B through genetic transplant, by implication all the character of A is transferred to B through this platform. And if A was a gay, it is possible for B to be a gay by implication. Changing the genetic order of B may cause change in character, behaviour and mood of thinking of B.

From the above explanation, it is therefore possible that one may transfer the character of gayness to another through genetic or DNA transfer during genetic engineering if the character of gayness is hereditary or genetically based.

In view of the question whether gayness or homosexuality is a hereditary factor or a disease, Chinese government in this direction deliberated that the issue of homosexuality is a

mental disease that needs a cure and is not hereditary based (reported in BBC July 2014). So many treatments were given to gays, but the phenotype of gayness was still manifesting even after the medication. Thus, the problem could not be solved using medical therapy. Here, science loses its ability to solve the phenotype disease in human nature that show in all gays. The central issue here is that is “gay” a mental disease? Or is homosexuality hereditary? We submit that there is need to advocate for proper genetic counselling before any DNA transfer is done. Evaluations should be done to A before transferring his gene to B. This will help a long way to reduce gayness in human nature if it is caused by hereditary factors as claimed by modern gays.

However, if being gay is a genetic issue, then should one be held morally responsible for the act? Thus, David Hull et al (2008) opines:

“Do genes make people gay”? This is a question scientists who study human sexuality hear all the time from politicians, students and people just curious about their own sexual orientation. Many people believe that the causation of sexual orientation has important implications for the moral status of homosexuality. Both common sense and moral theory tend to evaluate the acceptability of that behaviour. One cannot be held morally blameworthy for things over which one has no control. (319).

In view of the above position by David Hull, it has generated to a thought-provoking debate in the world today. Several countries are paving way for gayness while others do not. For example in United Kingdom and the USA, being gay is legal, while in Nigeria and some West African Countries it is not legal (Mendie 2015). We admit that this issue should not be politically based, but should be culturally founded. Meaning judging this issue contextually or culturally, it will be determined from the norms and customs that are common to the belief of the people. Acceptance from the Western perspective should not be acceptance from another cultural background. Meanwhile, a more philosophical examination will be welcome as regards the acceptance of homosexuality because of its hereditary backups. Thus, modern gays posit that those who are non-gays were born that way, and the gays were born to marry gay. In view of this thought-provoking fact, one should not come to an easy and quick conclusion considering the validity of gays’ argument, but necessary advancement of criticality and analysis should be adopted from the philosophical background.

Evaluation and Conclusion

The most fundamental aspect of human nature is on its ability to be rational, tool making abilities, and the ability to be friendly to other beings within the same ecosystem. This rational ability is what gives birth to the idea of tracing the origin and destination of human beings. Meaning if we came from a place or through a particular stage, where are we now going to? And what will we change to considering the developmental stages of human evolution. These are some of the questions we have attempted to respond to in this work which are some of the central problems of developmental biology.

Thus, the need for philosophical evaluation in a wider sense becomes so necessary on the moral implications of being gay or homosexuality in the society; hence biologists are employed to solve the problem by advancing on further research on the hereditary factors of being gay. We have captured that philosophy of environmental biology is an upshot of philosophy of biology as being explained under the caption “what is philosophy of biology?”

However, tool making ability which constitutes a major nature of all humans beings, became so necessary for human beings to task themselves by producing complex machines, developed certain mechanism and skills for the purpose of modifying, deleting, and creating a unique human species through the process called genetic engineering. This has helped human beings to determine the sex, character, intelligence, size, colour of clone humans. It has also helped barren women to have babies through artificial wombs, cloning, surrogacy, in-vitro fertilization and others. But certain challenges do arise as a result of this practice; this is where philosophy begins as a result of the ethical challenges befalling human beings in these practices. Philosophy which is regarded by many as the mother of all disciplines has the role of evaluating on the assumptions and presuppositions of any discipline to excavate their challenges and fashioning possible solutions through active cross-fertilization of ideas (Mendie 2015). In view of this position this work maintains that philosophy is like a building block to all disciplines, and as such philosophical tools become the foundation in tackling issues, rendering top ideas in

solving societal problems as it affect man and other beings within the ecosystem through mutual relationship with all existing entities.

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