

## Evolution of Modern Zoology

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### ABSTRACT

Technology has contributed to the development of zoology, and the electron microscope has played an important role in many biological discoveries, as have oscilloscopes Binary isotopes, radiometry, digital photography and satellite images, PCR and DNA, and GPS systems, computers, and many of the technologies that worked on Progress in research fields in various branches of zoology has even contributed to finding solutions to some of the problems facing the environment in order to develop terrestrial and marine resources and preserve biodiversity It was the discovery and identification of Mendelian genetics, the structure of DNA, the code, instinct and animal behaviour Primitive and hybrid species, parthenogenetic forms of life, and new, previously unknown kingdoms of chemomorphology all had a positive impact on the development of zoology This paper discusses the development of zoology in the modern era. What distinguishes zoology is its impact on environmental balance and diversity preservation issues Organisms, ranging from restriction enzymes, the discovery of cloning, genetic engineering, and genetic control of decomposition states. Understanding metabolic pathways supports the need to address these topics with careful review, as we will see in this paper.

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**Keywords:** Zoology, Electron Microscope, Biological Discoveries, Oscilloscopes Binary Isotopes, Radiometry, Digital Photography, Satellite Images, PCR, DNA, GPS Systems, Computers, Animal Behaviour, Primitive and Hybrid Species, Parthenogenetic Forms.

### 1- Introduction

Zoology is the scientific study of animals, or in other words, living organisms that live in the Earth's environment, from microorganisms to mammals. It is a field that reveals the complexities of animal life, their behaviour, habitats, and evolutionary adaptations. In this paper, we highlight the development of zoology, its importance, and the role of biodiversity in the natural environment what it represents is the delicate balance of ecosystems, maintaining a suitable environment for organisms and their interactions with ecosystems, the importance of nutrient cycling, seed dispersal, and preserving biodiversity.

In addition, it contributes to medicine and agriculture, helping to develop strategies to combat diseases, protect endangered species, and ensure sustainable food production. Among the most important branches of zoology is the anatomy department, which specializes in studying the structure and organization of animal bodies, to learn about the adaptations of animals to their environments. As for the physiology of organs, it focuses on the processes that occur inside animals to understand the work of various systems, such as the circulatory system, the respiratory system, and the nervous system.

As for behavioral science, it is concerned with studying the behavior and interaction of animals with each other and with the environment by observing and analyzing behaviors such as mating, searching for food, and social hierarchies to identify the evolutionary and environmental factors that shape the behavior of animals.

As for the branch of ecology It deals with the relationships between animals and the environment by studying the dynamics of the distribution of animals, energy sources within ecosystems, the complex web of life, and the factors that affect the survival of species. Then, evolutionary zoology works to determine the origins of animal life and its evolution by examining fossils, genetic data, and anatomy. Comparative, to reveal the history of species and the mechanisms that govern their adaptation and diversification, is one of the most important branches of conservation focuses on preserving and managing animal species and their habitats Biodiversity has become a wonderful way to understand animal life, from microscopic organisms in the oceans to the creatures of the savannah, this fabric that contributes to ecosystems.

The creatures have evolved adaptations to survive in diverse environments, such as chameleon camouflage, the echolocation capabilities of bats, and the migration patterns of birds, providing insight into the ingenuity of natural selection In addition to the complex ways in which animals communicate, beginning with bird songs and chemical signals of insects, which helps to understand survival strategies It also contributes to preserving the environment to protect endangered species and develop strategies for their resettlement.

## 2- Review of Previous Studies

The idea of natural selection remained an obsession among scientists. They worked on developing many fields of biology and becoming the backbone of zoology as a science concerned with phenomena affecting the biological environment, such as time and space. It studies it gradually, starting from molecules to cells and then organs [1]. Therefore, it includes all ecosystems [2-3]. Recently, scientists were able to conduct Experiments using Eppendorf tubes where space was limited, and they were able to obtain important results in record time [4]. In comparison, we will find that there are experiments for scientific research in molecular biology It requires a

longer time in addition to sufficient funding to conduct it in laboratories equipped with the latest equipment, where its operation is supervised by multidisciplinary scientists [5]. There are many phenomena in biology that are under research, most of which fall within the scope of the ecosystem, which requires more research and studies to identify the relationship between the characteristics of different animal kingdoms, the interaction between them, and the natural environments in which they exist [1-6]. Since the 1960s, the invention of numerical classification has been accompanied by many ideas related to racial genetics [7].

Thus, zoology needed to be reorganized with the participation of Botanists, Zoologists, and Geologists. In the 1980s, microbiology was recognized with the aim of focusing on molecular biology. During that period, a lot of research was conducted to review Molecular cell and developmental biology Molecular genetics and microbiology and neuroscience, all of which were studies that took a reductionist approach [8]. Later it became Integrative Biology An example of harmony between botanists and zoologists, who brought about a renaissance in ecology Organismal biology involves interdisciplinary research at all levels and is concerned with DNA experiments [9]. Electron microscopic images are credited with seeing and Studying the most important phenomena at the microscopic level. Satellites also played an active role in viewing and studying the El Niño phenomenon and its devastating environmental effects on living organisms.

During the seventies, chronology was used to study some [9-10]. Periodic phenomena of fires resulting from global warming [11]. Oscilloscopes were developed to enhance physiological research and study neurological phenomena [12]. By using radioactive isotopes such as carbon-14, scientists were able to track its movement in Molecules to determine time and have been effective in studying living organisms, ecosystems, and single-cell research [1-2]. Molecular biotechnology has provided important data about restriction enzymes and genes It

has even become a basis that geneticists rely on to transfer certain genes from one organism to another By plasmids and viruses [3-6].

Development in this science led to the production of insulin and growth hormone Chemical methods for E. coli bacteria that carry human genes divided into their genomes [12]. Biotechnology has also contributed to the production of genetically modified cows characterized by the presence of additional quantities 6. Proteins in milk have a positive effect because they reduce blood clotting factors, and medically it is believed to help treat hemophilia [7]. Genetically modified bacteria have been used as a vaccine against certain diseases such as typhoid [7-10]. In the field of environmental protection, recombinant DNA technology has worked to produce pollutant-eating bacteria, and biotechnology has also worked to resist pests by producing nitrogen fixation genes. In plants to increase yields [8].

Genetic engineering has succeeded in cultivating growth genes for animals such as elephants and cattle and has achieved excellence in the field of increasing weight and size [9. Genetically treated cows, also cultivating ostrich genes chickens, results that bypass natural selection [10]. These newly adopted phenotypes were adopted because they provide it excelled in crops of corn, soybeans, cotton, and tomatoes, all of which were engineered by genetic engineering. We must mention genetically modified organisms in order to be released into nature, despite the belief that... have harmful effects on other species in natural ecosystems, This requires dealing with environmental systems engineering with precision and decisiveness, and thus the need for environmental and genetic engineers to work together [2-5]. As it was Radiometry developed positively by installing transmitters in animals to study their movement in the natural environment, and it proved effective even in tracking sea turtles and whales, so it was possible to receive their signals Via satellites, data is then collected and analyzed to learn more about natural environments and study whale migration from the Arctic to the Antarctic All of them are evidence that

zoology was able to access natural marine and terrestrial environments and thus achieved many important results in the modern era Global Positioning Systems (GPS) have become an essential means of obtaining information and identifying relatively accurate coordinates when studying different breeds.

In fact, it has become a Biotechnological tool that is one of the parameters relied upon in the development of zoology [1-8]. For example, the polymerase chain reaction (PCR) has contributed to the Amplification of small amounts of DNA, which can be sequenced relatively quickly. DNA sequencing is used to determine degrees of relatedness animals and recover robust strains and develop probability densities to infer Possible paths in the future. The tremendous progress in personal computers, which weakened its computational and statistical capabilities and various operations, was a direct reason for opening up a number of new fields in Zoology and was used to re-archive the achievements of genetics and Mendelian genetics These are pivotal starting points in the development of zoology and the effect of X-rays as a cause of mutation, which Hermann Müller succeeded in dictating.

In the 1950s, the structure of DNA was discovered Genetic code, mechanism of genetics, transcription, and translation. The focus became particularly on instinct. The same applies to animal behavior, as was the case with speciation, hybridization, and reproduction parthenogenesis. W. D. Hamilton applied ideas including kin selection Health fitness and its impact on sexual selection [4-2]. As a result of all this research, the chemical kingdom of living organisms, metabolic processes, and the Krebs cycle were discovered. It was also found that the development of metabolic pathways or Its breakdown can occur in most mammals, and thus the synthesis of ascorbic acid occurs in most of them, with the exception of humans They need to supplement their diet by taking vitamin C. So do many genetic aspects Its characteristics can be controlled and improved such as development, developmental plasticity, and canalization It was also found that the ability of some animals to flight,

taking spindle shapes, navigation at specific times, the ability to determine echolocation, and isolation. This animal was credited with inspiring scientists to invent Infrared sensors. It has been discovered a wide range of pharmaceuticals and Analgesics, antibiotics, diuretics, emetics, laxatives, and tranquilizers From studying the feet of geckos as a type of lizard and their ability to run Above the glass and even running on the ceiling we find further evidence of natural selection [5]. It was for electronic scanning technology microscopic images show millions of tiny hairs, bearing hooks, and hundreds of spoons that allow the lizards to stick to smooth surfaces using nearly a billion stickers through suction, glue, electrostatic attraction and friction.

By studying the Nokai strain of gecko under the microscope After attaching it with epoxy to a soft wire, it was found that the resulting force was hundreds of spoons Which compresses and conforms to the substrate is related to the direct forces of Setal bonding When measured using precise technology, it was found to reach 10 million linear micrometers in terms of cohesion Using a two-dimensional electromechanical sensor, he found that simulating such force is actually beyond the limits of human technology But it is considered important for biologists in the future Designing effective and adaptable dry adhesives confirms that zoology has a complex hierarchical organization over time and space scales Where environmental systems require the development of a planning form For the temporal and spatial measurement of various biological phenomena over longer time periods and more extensive areas of sub-organisms and Processes and entities (11).

### 3- Discussion

Most subdisciplines of biology take a narrow reductionist application [4 In fact, a broader integrative approach must be adopted at all levels. The reason for this is that the integrative approach provides a complete understanding of A complex entity

across levels of organization, and some scholars note that the perspective of the two approaches or reductionism is the same as integrative It studies different types, often investigating how a biological entity works [5].

Physiology was also a product of the development of research into the biology of living organisms. It is the result of the efforts of biologists and the environment, who together contributed to the development of comparative anatomy and physiology. Scientifically, all approaches are necessary to understand any biological phenomenon because Proximate factors are always affected by final factors For example, birds migrating south during the fall Because it has compared the photoperiod to its internal biological time and thus understands that the decrease in day length is a stimulus for hormonal changes, which in turn change the behavior of the birds increases with increasing restlessness, and finally they begin to migrate south [6]. This is explained by evolution in that the migration of birds is due to the decrease in mortality rates during the winter, and they migrate south to search for an environment similar to the environment in which they previously grew. This is evidence of natural selection that leads to complex patterns of behavior of migratory birds, through differential positive selection.

Physiology confirms the mechanism by which migratory behavior in birds is necessary Because it is affected by direct environmental factors, contrary to what was stated in the theory of evolution I explained this as the strategy followed by individual birds A response to consistent long-term environmental patterns from spring through winter [7]. Ernst Mayr emphasized that the physiological explanation In fact, it is clearer than what the theory of evolution presented in general Behavioral, physiological and environmental events can be considered beneficial From within the evolutionary framework and vice versa (5-6).



#### 4- Conclusion

Zoology is a broad field that explores animal life. Through its various branches, it provides concepts for biodiversity, evolutionary processes, ecological dynamics, and the dramatic interconnectedness between species and their environment. Through the efforts of researchers, learning about the animal kingdom continues, contributing to the preservation of species, advances in medicine, and preserving the natural heritage that allows life to continue. Zoologists have been able to make many medical discoveries. Animal physiology and genetics research has derived important theories about human health and drug development from animals that are toxic to life So Van Zoology includes topics related to living organisms and other animals, and deals with everything that pertains to them and knowledge of their characteristics, characteristics, types, behavior, instincts, lifestyle and many aspects related to their life according to a scientific perspective based on experience and reasoning.

Biology stands out when studying zoology, plants, microbiology, biochemistry, marine biology, and other specializations, which indicates that it is a diverse field linked to the smallest cells and even entire ecosystems, so there is an influential future role on living organisms. Through these The paper we present Recommendations to conduct further research in the areas of impact of innovations and work development of genetics Genetics and Genomics Neuroscience, specifically genes and chromosomes that represent important features of living organisms, and mutations and genes, which determine the development, diseases, and natural diversity of living organisms.

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