ISSN: 2837-4509

DOI: 10.33552/IOJASS.2023.01.000510

Iris Online Journal of Arts and Social Sciences

Iris Publishers

Research Article

The Rationality of the Evolutionary Synthesis and Its Competing Theories

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Received Date: March 20, 2023

Published Date: March 27, 2023

Abstract

The evolutionary synthesis has stronger empirical coordination force, conceptual coordination force, and background coordination force. It is generally accepted by evolutionary biologists for its stronger comprehensive coordination force. Nowadays, a large amount of new information and new concepts have emerged in evolutionary biology, which goes beyond the traditional framework of evolutionary synthesis and brings many new empirical and conceptual problems to evolutionary synthesis, changing the state of its comprehensive coordination force. Some scholars have tried to construct an extended evolutionary program to replace the dominant position of evolutionary synthesis. Premature conclusions do not have enough basis, and a longer period of research and review is still needed, but the direction of this effort is worthy of recognition. Although these subsequent competing theories do not reach acceptable rationality for the time being, they are reasonable to pursue for their strong partial coordination forces.

Keywords: Evolutionary synthesis, Coordination force, Acceptance, Pursuit, Rationality

Introduction

Laudan once proposed two legitimate cognitive attitudes towards scientific theories, namely, acceptance and pursuit. Laudan pointed out that scientists usually pick a theory among a set of competing theories and research traditions and accept it, that is, they regard this theory and research tradition as correct. The criterion for rational selection is: "choose the theory (or research tradition) with the highest problem-solving adequacy ", in other words, "the choice of one research tradition over its rivals is a progressive (and thus a rational) choice precisely to the extent that the chosen tradition is a better problem solver than its rivals" [1]. It is also an extraordinary situation in the history of science that scientists begin to pursue and explore a research tradition before it is entitled to be accepted, compared with its competitors. In this regard, Laudan said, " scientists can have good reasons for working on theories that they would not accept"[1], "it is always rational to pursue any research tradition which has a higher rate of progress than its rivals (even if the former has a lower problem-solving effectiveness"[1][1].

[1] The coordination theory is a new theory of scientific philosophy proposed by Chinese scholar Lei Ma. It establishes a standard system for theoretical evaluation and theoretical selection from the perspective of scientific issues, breaking the thinking mode of the dualism of "either right or wrong" and "either true or false", and establishing theoretical evaluation and theoretical selection based on "strength of coordination force. " The standard of the coordination force is completely defined and explained in the coordination theory. Among them, empirical coordination force include ten standards: novelty, rigidity, clarity, consistency, accuracy, harmony, diversity, conciseness, unity, and certainty. Conceptual coordination force include eleven standards: novelty, rigidity, clarity, consistency, harmony, diversity, conciseness, connectivity, unity, certainty, and profundity. Background coordination force include five standards: experiment, technology, thinking, psychology, and behavior. (See Lei Ma. Conflict and Concert: A New Theory of Scientific Rationality [M]. Beijing: Commercial Press. 2006.) This article intends to evaluate the evolutionary synthesis and its competition theory from the perspective of the coordination theory.

But coordination theory has a new explanation for these two cognitive attitudes, "The theory with more comprehensive coordination force should be chosen. It is progressive (and therefore rational) for us to choose an abstract or concrete theory over its competitor precisely because the chosen abstract or concrete theory has more comprehensive coordination force than its competitors"[2]. Ma believes that such an improvement in Laudan's acceptance mode can make the advantages of Laudan's evaluation mode more fully displayed. Regarding Laudan's pursuit mode, Ma believes that it needs to be further clarified and enriched. "We distinguish internal progress and external progress of abstract theories, comprehensive progress and partial progress of concrete theories, and base the two legitimate cognitive attitudes of acceptance and pursuit on the concept of progress through enhanced coordination force, in order to prove that the following rationality of the above view, that is, we accept the theory with strong comprehensive coordination force, and pursue the theory with weak comprehensive coordination force but strong partial coordination force" [2]. The author tries to use Ma's coordination theory to understand the rationality of the evolutionary synthesis and its competing theories.

Why is evolutionary synthesis acceptable?

The evolutionary synthesis has completed the fusion of ideas during the period of synthesis of evolution theories. The tradition of natural history research and the tradition of experimental research have changed from conflict to coordination. It has absorbed the new achievements of modern genetics and introduced a series of inspiring new auxiliary hypotheses of the theory of evolution. It effectively defends and develops the basic core of Darwin's research tradition, better explains the origin and evolution of organisms, and is increasingly widely accepted because of its stronger comprehensive coordination force. The comprehensive coordination force of a theory are the sum of its empirical coordination force, conceptual coordination force, and background coordination force [2].

The evolutionary synthesis has stronger empirical coordination force

The effectiveness of the theory in solving empirical problems is called "empirical coordination force". " Empirical coordination force not only pay attention to whether the theory solves empirical problems, the number and weight of empirical problems solved, but also pay attention to other ways and strengths of theories to solve empirical problems. "[2]^{p86} Mayr summarizes the important consensus reached during the synthesis of evolution theories: about the gradual model of evolution, the gradual model and natural selection together as the basic mechanism and the only pointing force. At a Harvard University conference in 1974, one certain conclusion emerged from the conference. All participants, whether scientists or historians, young or old, agreed that a consensus concerning the mechanism of evolution appeared among biologists during the 1920-1950 period. [3] It can be seen from this that the evolutionary synthesis eliminates the empirical anomalous problems of experimental biologists and naturalists, further increases the number of types of empirical problems that have been solved by the theory, and reduces the types of empirical problems that cannot be solved by the theory, so we say that the evolutionary synthesis has stronger empirical coordination force than other predecessor evolution theories.

The evolutionary synthesis has stronger conceptual coordination force

The effectiveness of the theory in solving conceptual problems is called "conceptual coordination force". Conceptual coordination force focus on conflicts and coordination between concepts and viewpoints within a theory, between theories, and between theories and broader scientific beliefs [2]. Biologist Mayr particularly emphasized the importance of the improvement of the concept of biology. He believed that in biology, the discovery and improvement of concepts are often as important as the discovery of new facts; methods of concept improvement include eliminating invalid theories and concepts, eliminating inconsistencies and contradictions, input from other fields, and eliminating semantic confusion, the eclectic fusion of opposing concepts, etc. Because of the use of the population concept, the evolutionary synthesis regards species as clusters of reproductive isolation of populations and analyzes the impact of ecological factors (habitat occupation, competition, adaptive radiation) on the origin of high-level taxa of diversity, so it can explain all evolutionary phenomenon in a way that conforms to the known genetic mechanism and the observational evidence of naturalists. Perhaps the biggest impact of the evolutionary synthesis on evolutionary biology is to negate some misconceptions, such as soft inheritance, sudden change, evolutionary essence theory, spontaneous generation theory, and so on. In this way, geneticists and naturalists have achieved theoretical and conceptual harmony within the evolutionary synthesis, while also achieving harmony with anti-creationism and anti-essentialism outside the theory. From this, we assert that the evolutionary synthesis has stronger conceptual coordination force than other predecessor evolution theories [3].

The evolutionary synthesis has stronger background coordination force

Background coordination force are the effectiveness of theory in solving background problems [2], that is to consider the background factors of theory and knowledge, that is, the coordination and conflict of experiments, technology, thought, psychology, and behavior [2]. The rapidity of the spread of the evolutionary synthesis is as surprising as its sudden arrival. At an international conference held in Princeton, USA on January 2-4, 1947, representatives of most fields and schools of biology agreed with the conclusion of the evolutionary synthesis. All participants endorsed the gradual nature of evolution, the prominent importance of natural selection, and the population's view of the origin of diversity. The evolutionary synthesis has greatly enhanced the status of evolutionary biology [4]. In fact, evolutionary biology in the 1920s and 1930s had a low status in biology, but after the evolutionary synthesis was proposed, the situation changed radically. The most obvious change was in the United States, where the "Society for the Study of Evolution" was established in 1946, and the journal "Evolution" was launched in 1947. This change is also significant in the UK

and Nordic countries. Since then the number of journals, journal articles, general books, and textbooks on evolutionary biology has grown steadily. The evolutionary synthesis was quickly understood and accepted and supported by more people, thus improving the theory's psychological and behavioral coordination force, that is, background coordination force.

During the formation of the evolutionary synthesis, biologists in most branches of evolutionary biology accepted the main conclusions of the theory, which fully shows that the theory has high problem-solving effectiveness or theoretical coordination and is progressive. When we say that the evolutionary synthesis is progressive, but it does not mean that it is the truth but means that it has stronger comprehensive coordination forces than the previous competing theories. "The difference between the old and new theories is not the difference between true and false, but the difference in the size of the coordination force. The scientists abandon the old theory because they have found a new theory which they believe has stronger comprehensive coordination force" [2].

Why we can pursue the successor competing theory of the evolutionary synthesis?

Scientists are not prophets but explorers, and they can only tentatively formulate hypotheses about scientific problems. The same goes for the creators of the evolutionary synthesis. The fundamental assumptions of the theory are not of an untouchable nature, but rather a moving target, subject to rigorous and regular scrutiny by the evolutionary biology scientific community. After a period of research and review, the comprehensive coordination force of the theory will also change, that is to say, even the comprehensive coordination force that determine the acceptance of the theory are meaningful only at a certain moment or period of time. With the development of molecular developmental biology, ecology, systematic taxonomy, geology, and other biological branches, a lot of new information and new concepts have emerged. These new information and new concepts go beyond the traditional framework of the evolutionary synthesis, and inevitably bring many new empirical and conceptual problems to it, for example, the "central dogma" problem of molecular biology. The "Central Dogma" has always been the first principle of molecular biology, which stipulates that the flow of information in a biological system is always unidirectional, from DNA to RNA to protein. Recently, however, scientists have discovered that in a wide variety of organisms, including some viruses and eukaryotes (via retrotransposons), the flow of DNA to RNA can be reversed (a process named reverse transcription) [5]. If the molecular processes in the cases cited above really exist, they will obviously violate the so-called "central dogma" [5]. This situation also forces evolutionary biologists to acknowledge the need to reassess the question of the reliability of the direct evidence they provide in support of natural selection as a major evolutionary mechanism. There are other issues, such as the question of the extent to which the hierarchical structure of biological entities would undermine claims of natural selection (as the fundamental source of evolutionary pattern) [6]. The current debate on the evolutionary synthesis presents an intense trend. Some biologists assert that the evolutionary synthesis does not require any fundamental changes in its current circumstances; others tend to believe that a major revision of the evolutionary synthesis's traditional framework is required; Still more between these two claims, they both claim that many of the core principles of the evolutionary synthesis are acceptable and reasonable, and try to loosen the restriction of some assumptions so that some new information, new data, and new concepts can be introduced. More seriously, there are still some critics who are not satisfied with solving problems within the traditional framework of the evolutionary synthesis. They disdain tinkering with it, but go beyond the traditional framework, attack the core principles of the evolutionary synthesis, and try to construct an alternative plan with stronger comprehensive coordination force. The academic conference held in Altenberg in 2008 and its collection of papers can well illustrate this point. Carroll even went so far as to label evolutionary developmental biology the "third revolution" in evolutionary biology, " Over the past decades, a new revolution has unfolded in biology. Advances in developmental biology and 'Evo Devo' have revealed a great deal about the invisible genes and some simple rules that shape animal form and evolution. Much of what we have learned has been so stunning and unexpected that it has profoundly reshaped our picture of how evolution works." [7] Since the late 1990s, the field of evolutionary biology has produced a plethora of books and articles, some directly proposing some formal alternative, and others pertaining to various other explanations for similar effects. As the academic community hopes, these competing evolutionary proposals can be thought-provoking and stimulate more constructive discussions. It took decades for the evolutionary synthesis to become the dominant paradigm, and we certainly cannot expect competing theories with the same comprehensive coordination force in an instant. Although it is too early to jump to conclusions about the success of these competing theories, we can assert that the direction of this effort is positive. These competing theories are under constant scrutiny from the evolutionary biology scientific community. The scientific community makes an assessment and a choice based on the state of comprehensive coordination force between the evolutionary synthesis and its competing theories, deciding which solution to accept, which claim to reject, or which theory to pursue. We are soberly aware that any scientific theory needs constant revision and addition, although these changes may not necessarily touch the real core of the theory. We do not believe that the claims made by some that "the evolutionary synthesis is bankrupt," or "we need a new theory of evolution" are sufficiently grounded because these competing theories are not yet of acceptable plausibility. But it is reasonable to pursue. In today's view, string theory is not generally acceptable to most people, but it has some strong local advantages, so it can be pursued [8].

Conclusion

Responding to the challenge of competing theories of the evolutionary synthesis, Mayr defended: "No one will deny that there are many unresolved questions, but whatever answers to these questions may be answered in the future, it is unlikely that they will contradict with Darwinism. It seems to me that this confidence has not been lost at all to this day" [9]. The debate between the evolutionary synthesis and its competing theories continues. In order to effectively resolve this debate, we try to propose a strategy for

coordinating pluralism, which advocates two kinds of rationality in the concept of enhancing coordination for progress: the rationality of acceptance and the rationality of pursuit. "Whether we accept a theory within a certain period of time depends on its comprehensive coordination force; whether we pursue a theory within a certain period of time depends on its partial coordination force" [2]. As Ma believes, "Scientists, at a certain time, should accept a theory which has the strongest comprehensive coordination force, but their attitude to the theory may be changing, because, at another time (the interval of the time is generally long because scientific research is an arduous process of expending time and energies), the condition of the theory's comprehensive coordination force may have changed. Any single or partial coordination force, at a certain moment, are factually undetermined. [10]" In other words, at the current moment, evolution biologists can accept the synthesis as the theory with the strongest comprehensive coordination force and agree with its dominant position; at the same time, they can pursue new hypotheses or newly discovered alternatives including evolutionary developmental biology or genomics as the theory with stronger partial coordination force. For the time being, we believe that it is justified to retain the basic principles of the evolutionary synthesis because it can make the new theory obtain the coordination force of empirical coherence and conceptual coherence. But whether to stick to the core principles of the evolutionary synthesis in the future depends entirely on the comprehensive coordination force of competing theories. That is to say, the so-called core things do not necessarily have to be persisted forever. Again, until competing theories have reached a satisfactory theoretical and evidence base, it would be a fairly reasonable cognitive attitude to allow them to co-exist with the evolutionary synthesis or to adopt a strategy of suspension.

Acknowledgment

The author would like to acknowledge financial support from Chizhou University Introduced The Doctoral Scientific Research Launch Fund Project through grant CZ2022YJRC02.

Conflict of Interest:

No conflict of interest.

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