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Research Article

The K–Pg boundary ecological disaster: pandemics and hyper-virulence as significant causes of mass extinction of biological species. Article 1.

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Abstract

A hypothesis has been formulated suggesting that a pandemic significantly contributed to the mass extinction of biological species at the K–Pg boundary. The characteristic feature was hyper-virulence. The pandemic was attributed to a physicochemical factor associated with platinum group elements. Under specific conditions, their characteristics undergo substantial transformation. This is clearly observable at the nanoscale and across various compounds. The K–Pg hypothesis is founded on the observation of a significantly elevated concentration of iridium at the K–Pg boundary. The hypothesis was formulated in accordance with the cognitive framework of infectious ecology. This represents a new fundamental understanding of the pathogenicity of microorganisms and the manifestation of infectious diseases. The selectivity of the mass extinction process at the K–Pg boundary can be elucidated based on the infectious factor. The hypothesis is methodically outlined across a collection of articles. The initial article serves as an introduction. A concise overview of the hypothesis is presented. An analysis of the theoretical and methodological challenges associated with researching mass extinctions is presented. A variety of unresolved problems have been identified in this area of research. Not all of them pertain to the intricacies of the research subject. We are dealing with a fundamentally constrained set of information and distinct occurrences. This inevitably influences the formulation and resolution of issues. However, a vital portion is also connected to the prevailing cognitive standards within the scientific community. The inquiry is examined through the lens of the science of science. Key emphasis is placed on the principles of scientific reasoning. There are several inconsistencies evident in expert analysis. There is a tendency to overlook essential issues that remain

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unresolved. The impact of hype is notable. Scientific advancements that were not previously directly associated with the topic of mass extinction at the K–Pg boundary can significantly enhance the study of this subject. Examples of such studies are presented. The assessment of problem formulation and solution has been conducted. The K–Pg Hyper-virulence hypothesis has been formulated to elucidate the extinction of numerous biological species at the K–Pg boundary. New foundational conclusions have been established. This annotation pertains to the complete series of articles.

Keywords: K–Pg boundary, hyper-virulence, K–Pg boundary pandemic, mass extinction, platinum group elements, logic of science, AI as a colleague in scientific research, hype in science.

Key Points

1. Mass extinction requires a new explanatory paradigm. Existing explanations of the K–Pg extinction (e.g., the Alvarez hypothesis) remain incomplete, particularly in explaining the selectivity of extinction. The paper proposes a new paradigm — infectious ecology — to reinterpret these processes.
2. Infectious processes as a major extinction factor. The hypothesis argues that a pandemic with hyper-virulence, triggered by physicochemical signals (platinum group elements), played a significant role in the mass extinction. Infectious processes are considered a natural and recurrent mechanism capable of affecting entire species.
3. Limits of current scientific knowledge and data. The available fossil record represents a highly incomplete and biased sample of past biodiversity. As a result, widely accepted conclusions (e.g., 75% extinction) are based on severely constrained data and require methodological correction.
4. Crisis of scientific explanation. Much of the existing research relies on plausible but non-theoretical explanations, post hoc reasoning, and fragmented micro-hypotheses. There is a lack of meta-scientific reflection, weak integration with epistemology, and a dominance of heuristic over theoretical approaches.
5. Science as a system with its own dynamics. The development of knowledge is shaped by paradigms, institutional structures, and internal resistance to innovation (“implicit bunker of normal science”). Scientific communities may reproduce existing frameworks rather than generate new understanding, limiting cognitive progress.

Introduction

The intricacies of biodiversity on planet Earth are highly sophisticated. A considerable number of questions remain unresolved by science or possess answers that are only in their initial stages. Insufficient understanding of various issues may prove to be detrimental for humanity as a biological species. We are observing and are partially involved in yet another vital decline in biological species. The ongoing process of

species extinction is predominantly linked to human influence on the natural environment. This comprehension of biodiversity change can distinctly highlight anthropocentric foundations. It seems that all outcomes are contingent upon the Homo sapiens. The process may be halted at any time, allowing for the identification of a "balanced" solution to the existing issues. Pivotal financial resources will be allocated, and a resolution to the environmental challenges will undoubtedly be achieved.

The causes of species extinction can vary significantly. They might be unrelated to human destructive activities. Financial resources hold no value in this process. Mother Nature operates independently of monetary concerns, which serve as the main motivation for the actions of one particular primate species. Mass extinctions of biological species may be associated with infectious agents, representing a phenomenon that is inherently part of nature. Fatal infectious processes are an integral aspect of nature, just like all other elements within it. Nature generates infectious processes on a routine basis. There is substantial evidence indicating that they may contribute to species extinction.

To comprehend this momentous situation, it is essential to cultivate new foundational viewpoints regarding the dynamics of biodiversity on our planet. Infectious ecology represents a key advancement in scientific research. This presents a fundamentally new perspective on the pathogenicity of microorganisms and the characteristics of infectious diseases. This pertains to the impact of physicochemical signals on the expressions of microorganism pathogenicity and the subsequent implications.

The applications of essential novel findings in comprehending the characteristics of microorganism pathogenicity and the occurrence of infectious diseases can vary considerably. The mass extinction of species at the K–Pg boundary represents one of the most fascinating and enigmatic chapters in the history of Earth's biodiversity. The prevailing belief is that its consequence led to the extinction of around 75% of the biological species during that period (Alvarez et al [1980], Pope et al [1998], Schulte et al [2010], Bond et al [2017], Wilf et al [2023], Racki [2012], Gulick SPS et al [2025], Chiarenza et al [2020]). This mass extinction is elucidated through multiple perspectives. His most renowned explanation pertains to the Alvarez hypothesis (Alvarez et al [1980]). Everything appears to be relatively clear; however, there is a minor caveat. This pertains to the inability of the Alvarez hypothesis to account for the peculiar selectivity observed in the mass extinction at the K–Pg boundary. Indeed, an asteroid was present. It emerged as a critical source of iridium for planet Earth (Goderis et al [2021], Esmeray-Senlet et al [2017], Premović et al [2012], Racki [2011], Elliot et al [1994], Loroch et al [2016]). There is ample evidence to substantiate the assertion that a global environmental catastrophe has taken place. Nonetheless, the degree to which all of this is directly associated with a selective mass extinction during this period is still uncertain. The primary focus is on the selectivity inherent in the mass extinction process.

Materials and Methods

The material of the article encompasses a relevant body of information pertaining to the environmental catastrophe at the K–Pg boundary. We consider it through the

lens of infectious ecology as an innovative paradigm. An evaluation of information is conducted consistently from the specific perspective of the new paradigm. The considerations extend beyond the requirements of scientific reasoning. Logic of science stated that the expert's initial position must be articulated with utmost clarity. The accuracy of the initial perspective influences all aspects of its implementation. This is also essential for assessing the cognitive potential of the new paradigm. The examination of this paleo context marks the initial encounter with this application of infectious ecology. Previously, the discussion surrounding paleo-infections was primarily focused on anthrax and its occurrences in the 19th century. This was executed in a systematic manner for the territory of the Russian Empire (Nikolaenko [2013-2020], Nikolaenko [2011]).

In the series of articles, abduction serves as the primary research method (Charles Sanders Peirce [1878], Peirce [1934], Gilbert [1965], Kakas et al [1993], Eiter et al [1997], Denecker et al [2002], Paavola [2004], Perri et al [2003], Kakas et al [2020]). A version of abduction is presently under active development, specifically designed for this type of cognitive case. The uniqueness of this subject is found in its focus on ancient times, encompassing a multitude of dispersed fragments from the past that allow for varied interpretations, along with numerous other elements. The occurrences at the K-Pg boundary merit a thoroughly constructed abduction scenario that facilitates the rationalization of research. In the absence of a structured approach to research, it may devolve into mere collecting. An individual is engaged in the collection of stamps. An individual is gathering buttons. An individual is engaged in the collection of fossils. The shift from scientific collection to elucidating the environmental disaster at the K-Pg boundary necessitates a thorough rationalization of the scientific research and the activities of the scientific community involved in this field.

I hold a strong respect for the rationalization of scientific inquiry. The rationalization of the entire subsequent research is a specific aspect of formulating a scientific question. Developing a cognitive question and justifying the cognitive process involved is a rather extensive undertaking. This was evident from my initial studies. They were linked to the Metageography (Nikolaenko [1982], Nikolaenko [2002]). When dealing with a highly intricate research subject that has restricted access, it is essential to begin with a thoroughly detailed justification of the expert's stance. In the absence of this, there is a high likelihood of substantial information loss, which may lead to inaccurate results. The issue primarily pertains to the expert's bias. He selectively chooses facts that align with his perspective. Both are entirely inappropriate. This represents a common stance within the field of historical science, where the interpretation of facts and the promotion of the "accepted" perspective underpin the operations of the expert community.

It should not be perceived that abduction is the sole approach employed in the conducted work. The emergence of infectious ecology as a novel paradigm can be traced to the latter part of the 1960s and into the 1970s. The studies were characterized by a "classified" nature. During that period, there were no alternative methods available to execute such tasks. This was associated with the "Microbe" Institute, situated in

Saratov (USSR), a city restricted to foreign visitors. Fieldwork was carried out across multiple regions of Central Asia. The names of Professors Innokenty Soldatkin and Yevgeny Rothschild are widely recognized. A substantial team of experts was engaged in the project (Soldatkin et al [1971], Rothschild et al [1993], Rothschild et al [1977], Rothschild [1978], Zhuravlev et al [1979], Dorozhko et al [1980], Zhulidov et al [1981], Rudenchik et al [1983], Dorozhko et al [1985], Soldatkin et al [1986], Rothschild et al [1988], Soldatkin et al [1988], Rothschild et al [1993], Rudenchik et al [1994], Rothschild et al [2000], Rothschild [2001], Nikolaenko et al [2011], Nikolaenko et al [2011], Rothschild [2011], Rothschild [2011], Rothschild [2014], Rothschild [2015]). Pivotal scientific results were achieved. The research was carried out by examining plague outbreaks in rodents within their natural habitat. Research indicates that infectious phenomena in natural conditions are influenced by the manifestation of physicochemical factors, which dictate their spatiotemporal characteristics.

In the context of contemporary infectious ecology, it can be stated that "geochemistry impacts the geographical distribution of plague occurrence in rodents under natural conditions". Y. pestis does not consistently demonstrate its pathogenic characteristics. Only under the impact of specific physicochemical signals. This multiyear project was unable to reach a logical conclusion. The outcomes were unexpected, leading to the project's termination. Scientific innovations do not resonate positively with a major number of individuals. The outcomes were maintained due to the efforts of Professor Yevgeny Rothschild, who operated in total isolation during the 1990s and 2000s.

Subsequently, comprehensive new research was conducted to clarify the pathogenicity of microorganisms and the presentations of infectious diseases in accordance with an updated cognitive framework (Nikolaenko [2017, 2017, 2018, 2020, 2020, 2021]). However, that represented a completely different level of theoretical and methodological understanding of the processes.

Alongside the abduction that underpins this hypothesis, there is a considerable amount of field research experience, which includes both my own and that of my colleagues. The prevalence of abduction in this series of articles can be attributed to a) the examination of events from an extremely distant past and b) the current limitations that restrict the undertaking of our own experimental work.

Goal and Objectives

This series of articles aims to systematically present the hypothesis that an infectious agent significantly contributed to the mass extinction of biological species at the K–Pg boundary. We shall refer to it as the "Hyper-virulence Hypothesis at the K–Pg Boundary." Abbreviated as "K–Pg Hyper-virulence." This concept can be articulated in several ways; however, we will regard this definition as the primary one.

In this hypothesis, I refrain from using the terms "primary," "main," or "decisive" role in relation to the mass extinction. Given our present comprehension of the events at the K-Pg boundary, the application of such terminology lacks justification. The point on the significance of the infectious factor in this mass extinction. The discussion is

about the "significant" role of the infectious factor in this mass extinction. It has become a pandemic. A substantial number of biological species were adversely affected by it. That's the essence of the hypothesis.

In order to reach the goal, the subsequent tasks have been outlined:

1. Examination of the Alvarez hypothesis. Numerous publications exist regarding hypotheses. It appears that all pertinent points have already been addressed. There is a limited amount of scientific innovation directly related to this hypothesis. Clarifications regarding the details are currently underway. Infectious ecology provides a novel viewpoint. The complete dataset is assessed in accordance with this criterion.

2. A particular focus on the methodology employed in researching events from such a distant past. This situation presents a specific case of abduction, and it is essential to systematically discuss the validity of the circumstances involved. Abduction is far from being a trivial matter. It is crucial to create a specialized version of abduction tailored to the study of mass extinction at the K–Pg boundary.

3. Investigate efforts to elucidate this mass extinction, particularly through the lens of an infectious agent. Until recently, these remained relatively obscure works (Vajda [2004], Casadevall [2005, 2012], Casadevall et al [2020], Berry [2020], Cockell et al [2021], Smith et al [2023], Heitman et al [2011], Bergman et al [2010], Poinar et al [2008]). They become overshadowed by the multitude of other publications and appear peripheral. From the perspective of the infectious ecology paradigm, they can be assessed in a markedly different manner. While I can't say that these works profoundly influenced me, they are connected to the infectious factor and warrant systematic evaluation.

4. Examination of counterarguments pertaining to the Alvarez hypothesis. They are exceptionally intriguing. This text elaborates on the hypothesis and its interpretation through the lens of infectious ecology, a field that was not established at the time the Alvarez hypothesis was introduced. A specific number of frequently articulated counterarguments can be addressed based on new scientific evidence.

5. Utilizing concepts and terminology from infectious ecology to elucidate the mass extinction of species at the K–Pg boundary. This represents one of numerous instances of species extinction documented in scientific literature. A considerable amount of information exists regarding this subject, with its primary distinguishing characteristic being the clear indication of an anomalous concentration of iridium specifically linked to this period. This represents a unique natural phenomenon and serves as the primary focus of the K–Pg Hyper-virulence hypothesis. This presents a fascinating illustration of a natural process at work from the standpoint of infectious ecology.

6. A comprehensive overview of the K–Pg Hyper-virulence hypothesis as a significant factor contributing to the mass extinction of species at the K–Pg boundary. The concept of hyper-virulence has been examined on multiple occasions. This type of hypothesis has numerous applications in epidemiology (Harada et al [2018], Russo et al [2019], Choby et al [2020], Aschtgen [2020], Lan et al [2021], Zhu et al [2021], Hala et al [2024], Tang et al [2025], Hetta et al [2025], Tian et al [2025], García-Cobos et

al [2025], Wu et al [2024], Cubero et al [2016], Yang et al [2025], Maury et al [2016], Yakob et al [2015], Rasigade et al [2013], Xiao et al [2023], Fatima et al [2019], Carneiro et al [2020]). This text examines the mass extinction event at the K–Pg boundary. This is executed consistently in accordance with infectious ecology as an emerging paradigm. This term is acquiring a new content.

7. A presentation outlining various possibilities for the experimental verification of the K-Pg Hyper-virulence hypothesis in relation to this extinction event. An opportunity exists for both theoretical reasoning and the execution of a series of experiments aimed at generating the phenomenon of hyper-virulence in the pathogenic properties of microorganisms due to exposure to a physicochemical signal. We are discussing experimental work concerning platinum group elements. This may serve as a foundation for a novel explanation regarding this specific mass extinction. The experimental approach in infectious ecology is entirely integrated.

A series of articles will address these tasks. I am confident that all of them will be published in the journal "Pollution and Diseases." A novel scientific perspective is emerging. This is connected not only to elucidating the mass extinction event but also to several other unresolved inquiries pertaining to infectious diseases and biological extinctions.

RESULTS

A summary of the K–Pg Hyper-virulence hypothesis

As this will be a series of articles, let us proceed directly into the essence of the hypothesis. This article offers a concise overview. The details of the hypothesis will be elaborated upon in the subsequent texts.

Critical analysis and the meta-scientific foundations of the hypothesis

1. The Alvarez hypothesis does not represent a fully accurate scientific advancement. It contains a substantial number of inadequately developed theses, rather than "dark spots." There is a lack of systematic work specifically addressing them. The fundamental question is inadequately articulated. Every hypothesis necessitates thorough development. If a hypothesis is holistic in nature, and Alvarez's hypothesis exemplifies this, its development should proceed in multiple directions. In this instance, it is not permissible to reference your own highly specific area of expertise. The outcome of flawed hypothesis development will lead to the gathering of a substantial volume of disjointed information, lacking a scientific comprehension of the events that transpired.

2. The absence of research in numerous domains concerning the environmental catastrophe at the K–Pg boundary can be challenging to comprehend. The development of this hypothesis appears to be influenced by a degree of randomness. This matter necessitates further discussion. What factors contribute to the hypertrophy of certain hypothesis development directions, and why is there a lack of discourse regarding the logically subsequent questions? Responses to these inquiries should be subjected to rigorous analysis under the framework of the Science of Science.

3. The main drawback of the Alvarez hypothesis, along with the comprehensive research linked to it, is the absence of adequate meta-reflection. We are addressing a situation that clearly involves abduction. A substantial amount of research exists regarding abduction-based cognitive activity. However, they are of a general nature. The current scenario presents a paradox where an extensive body of information exists regarding individual paleo artifacts, while the theoretical interpretations remain highly inconsistent. A focused approach to developing a cognitive procedure is essential for exploring this topic. Optimizing scientific endeavors can enhance research outcomes. The absence of a meta-scientific foundation for this research results in numerous shortcomings. The examination of this subject necessitates the tailored development of an abduction model specifically designed for this case.

4. It is essential to focus on the most recent advancements concerning abduction in relation to the application of AI (Pareschi [2025], Imran et al [2025], Kakas et al [2020], Zhang et al [2021], Suchan et al [2020], Arivazhagan et al [2025], Magnani [2025], Handbook of Abductive Cognition [2022]). There are several compelling reasons to assert that AI will assist in comprehending this type of issue. To achieve this, it is essential to not only a) advance AI development, but also b) reform the standards of scientific research. They may not consistently yield the desired results. The presence of a highly advanced colleague like AI significantly impacts cognitive activity. AI should not be regarded as a subordinate entity. AI is a fellow professional. There is a necessity for mutual learning. It is not solely a matter of us instructing AI; it is also a process of learning for us. This holds particular significance for subjects associated with a wide range of diverse and categorically distinct data, coupled with theoretical concepts that lack convincing support.

5. Emphasis is placed on accurately determining the scope of effective application for K–Pg Hyper-virulence hypothesis. Is it possible to attribute the mass extinction of all biological species at the K–Pg boundary to an infectious factor? Certainly not. Given the complexity and multifaceted nature of this process, it is unproductive to seek a singular explanation. Our knowledge is somewhat limited. Infectious agents may serve as a foundation for elucidating the extinction of numerous biological species. Discussing the universality of its application is unnecessary. A variety of extinct biological species will undoubtedly exist that cannot be solely attributed to an infectious factor. Analysis of data regarding extinct and surviving species from that period requires careful consideration.

Main Content of the Hypothesis

6. An infectious disease played a vital part in the mass extinction of biological species at the K–Pg boundary. It was characterized by a widespread impact. The primary feature was hyper-virulence. It has the potential to lead to widespread fatal infectious diseases. Mass infectious processes occurring on planet Earth are a standard phenomenon. Currently, we lack a comprehensive understanding of the emergence and disappearance of mass infectious processes. It is evident that mass infectious processes are a relatively frequent and occasionally lethal occurrence on planet Earth. This can be articulated in multiple ways; however, one aspect remains evident: selectivity

is a crucial attribute of their specificity. They are exercising discretion in their actions. It appears that an individual is in grave danger. In certain instances, infectious processes can lead to the extinction of entire biological species. Not individuals, but rather specific species. The well-known 75-25% ratio of extinct to surviving species can be elucidated on this foundation. While there are numerous unanswered questions in the explanation, the current focus is solely on the direction, and nothing beyond that.

7. The origin of the pandemic infectious process characterized by hyper-virulence was identified as a physicochemical signal resulting from an asteroid impact (Nikolaenko [2023]). This physicochemical signal pertains to platinum group elements (PGEs). Under specific conditions and at the nanoscale level, as well as in various compounds, their characteristics undergo relevant changes (Yang et al [2010], Li et al [2017], Guddneppanavar et al [2007], Alessio [2017], Rosenberg et al [1969], Brabec et al [2005], Baranov et al [2019], Roy et al [2017], Poynton et al [2017], Lee et al [2009], Farrer et al [2013], Metzler-Nolte [2019], Yang et al [2010], Shafeeq et al [2019], Li et al [2017], Hazra et al [2018], Singh et al [2017], Thangavelu et al [2020]). This resulted in a specific activation of the pathogenic properties of microorganisms during that time frame. It extends beyond merely iridium. It is important to consider the entire platinum group.

8. The K–Pg Hyper-virulence hypothesis proposes that the physicochemical signal governing the selective activation of pathogenic traits in microorganisms remain consistent throughout Earth's history. In the field of infectious ecology, contemporary pandemic processes and analogous historical events are articulated using consistent terminology. An illustrative instance might involve cases pertaining to anthrax. Numerous outbreaks of anthrax occurred during the 18th and 19th centuries. Bacillus anthracis is currently may classified as an endangered species. Mass outbreaks of anthrax are frequently associated with invasive physicochemical signals (Nikolaenko [2013]). The explanation of infectious processes in the geological past follows a comparable framework. The asteroid impact emerged as a exceptionally atypical physicochemical signal. The uniformity in elucidating the phenomenon of infectious diseases represents a cognitive advantage to infectious ecology. Engaging in this venture involves inherent risks, yet I am approaching it with full awareness. This discussion extends beyond merely elucidating the ecological catastrophe at the K-Pg boundary; it also involves advocating for infectious ecology as a key paradigm.

9. Evidence suggests that this was not a situation involving an episodic infectious process resulting in death within 40-200 hours. This instance did not involve fatal pasteurellosis, a condition that results in the death of hundreds of thousands of Saiga tatarica individuals within a span of 2-3 days (Aykimbaev et al [1985], Bekenov et al [1998], Martinevsky et al [2001], Orynbayev et al [2013], Kospanova et al [2014], Fereidouni et al [2019], Robinson et al [2018], Kock et al [2018], Orynbayev et al [2019], Mullineaux et al [2024], Nikolaenko [2024],Nikolaenko [2024]). The process may have been extensive and rather gradual. The dissemination may have transpired within a particular biological species. This process occurs over an extended duration, yet it carries a significant risk of being fatal. The biological species faces vital

challenges ahead. This sentence has been suspended. This option for the manifestation of the infectious factor as a key cause of the biological species' disappearance may have been predominant.

10. Infectious processes associated with the transmission of infection through the consumption of carcasses or contact with other biological species may have played an integral part. A considerable number of examples of this type exist. The outcome is contingent upon the particular biological species and pathogens involved. For instance, consuming the remains of animals that succumbed to anthrax results in infection and ultimately the demise of the predator. This is clearly apparent in individuals. An example may involve the utilization of meat from a cow or horse that succumbed to anthrax (Nikolaenko [2013]). Consuming the remains of rodents that succumbed to the plague in natural environments does not result in any repercussions for ants (Rothschild [1977]). However, such a scenario may only serve a subordinate function.

11. The K–Pg Hyper-virulence hypothesis addresses a decisive gap in the current understanding of the ecological catastrophe at the K–Pg boundary. This pertains to the selectivity of both extinct and extant biological species. The proportion is evidently approximate. A considerable amount of information has been lost. The survival of such a notable proportion of biological species, even at 25%, necessitates a thorough explanation. The explanation is grounded in the selectivity of how the infectious process manifests. The selectivity of the infectious process remains unexplained. The issue is articulated within the realm of infectious ecology, and efforts are underway to address it. The notion that the infectious process of biodiversity change is solely occurring in the present lack's substantiation. This matter is examined comprehensively with illustrations of fatal pasteurellosis, which periodically affects Loxodonta africana (Azeem et al [2020], van Aarde et al [2021], Evans et al [1906], Chandranaik et al [2016], Harish et al [2009], Singh et al [2002], Dudley et al [2001], van Aarde et al [2006], Chamaillé-Jammes et al [2014]).

Verification of hypotheses and their subsequent advancement

12. The K-Pg Hyper-virulence hypothesis serves as a significant factor in the mass extinction of biological species and can be subjected to experimental verification. We are pleased to inform you that all tasks can be executed in strict compliance with Popper's criterion (Popper [1963], Popper [1972], Popper [1983], Lakatos [1970], Kuhn [1962], Feyerabend [1975], Chalmers [2013], Godfrey-Smith 2003], O'Hear [1980], Miller [1994], Grünbaum [1976], Laudan [1983], Agassi [2014], Gattei [2009], Rowbottom [2010], Parusniková et al [2021]).

13. The hypothesis contains essential propositions that can be systematically evaluated and improved through experimentation. The discourse surrounding the Alvarez hypothesis is typically marked by a robust application of the experimental method (Holsapple et al [1982], Morgan et al [2016], Ohno et al [2014], Goderis et al [2015], Belcher et al [2009], Belcher et al [2010], Bardeen et al [2017], Popova et al [2013], Cheng et al [2023]). That is excellent! The experimental direction of infectious ecology development aligns seamlessly with this paradigm. The prospects for experimental verification of the new hypothesis appear to be quite promising.

The K–Pg Hyper-virulence Hypothesis and the Infectious Ecology Paradigm

14. The Hyper-virulence Hypothesis at the K–Pg boundary is grounded in the cognitive framework of infectious ecology. This presents a fundamentally new perspective on the nature of microorganism pathogenicity, the phenomenon of infection, and infectious diseases. A comprehensive system of concepts and terminology has been established to elucidate the phenomenon surrounding the emergence and disappearance of infectious diseases.

15. Within the framework of infectious ecology, there are comprehensive advancements regarding diffusion-based infectious processes. The diffusion process can often lead to the extinction of a biological species or substantially reduce its geographical range. This matter concerning the environmental catastrophe at the K–Pg boundary should not be overlooked. The phenomenon has not been extensively studied; however, the core concept holds important potential.

16. Research into the topic of mass extinction at the K–Pg boundary holds important implications for the infectious ecology paradigm. This represents one of its potential applications. This hypothesis serves as a test case to evaluate the effectiveness of the paradigm in question. An opportunity exists to enhance the paradigm and cultivate a fresh perspective on enduring fundamental questions that have encountered stagnation along the cognitive journey.

The K–Pg Hyper-virulence Hypothesis and Dominant Views on Microbial Pathogenicity, the Phenomenon of Infection, and Infectious Diseases

17. The Hyper-virulence Hypothesis at the K–Pg boundary fundamentally challenges the prevailing comprehension of pathogenicity in microorganisms, as well as the processes of infection and infectious diseases. This contradiction should be viewed not as a flaw, but rather as an advantage of scientific innovation. To gain a comprehensive understanding of the hyper-virulence pandemic process hypothesis as a major factor in the extinction of numerous biological species at the K–Pg boundary, it is advisable to thoroughly explore the cognitive standard of infectious ecology.

18. It is obvious that emerging fundamental concepts related to the discrete activation of pathogenic properties of microorganisms, the notion of "pure infection," and other advancements in infectious ecology are prompting major contemplation among epidemiologists and veterinarians. The reaction of supporters of the prevailing paradigm when faced with a fundamental novelty has been documented extensively. Scientific inquiry consistently demonstrates that even prevailing paradigms undergo periodic transformations. I anticipate that a comparable narrative will unfold regarding the prevailing paradigm of epidemiology in the future. This topic has been extensively discussed in various sources. The cognitive capacity of contemporary epidemiology is exemplified by the scientific analysis of the recent COVID-19 pandemic. Subsequent investigations into the species - reservoirs, as well as allegations concerning a potential pathogen leak from the laboratory in China, did not advance. Fundamental knowledge cannot be purchased.

The Evolution of the Hypothesis and Initial (Non-)Publications

I proposed the hypothesis that an infectious agent played a very significant role in the mass extinction of biological species at the K-Pg boundary in mid-2021. The conclusion was a logical extension of the cognitive framework within infectious ecology. The shift toward themes related to the geological past was entirely expected. I hold a university degree in geography. The exploration of natural processes occurring on planet Earth is entirely valid.

I believe that the infectious factor remains a constant presence on planet Earth. Infection represents a periodic discrete state of microorganisms and their ecological systems, forming an integral aspect of the natural world on this planet. The natural world possesses all the necessary elements to produce these distinct states. An infection can be likened to a rainbow. It occurs in particular circumstances and lacks stability. Certain natural phenomena of this nature may pose no threat. A representation of the identical rainbow. Certain discrete phenomena can pose a fatal risk to specific biological species. An instance is fatal pasteurellosis, which has the potential to kill hundreds of thousands of *Saiga tatarica* individuals. Neither the first nor the second version can be considered standard.

In their specific manifestation, infections may evolve; however, the fundamental principles governing how microorganisms' manifest pathogenicity and how infectious diseases present themselves remain constant. Dinosaurs were susceptible to various infectious diseases. Contemporary individuals possess various options. With the evolving ecology of pathogens, we can anticipate the emergence of new specific diseases. However, they do not alter the conventional patterns of microorganism pathogenicity development and the biological presentations of infectious diseases. The specific manifestations of the infection are consistently highly variable. Nature is performing "infectious jazz." Variations are influenced by: a) the specificity of microorganisms displaying pathogenic properties, b) the specificity of their ecological contexts, and c) the specificity of the physicochemical signals that serve as catalysts for change.

The events at the K-Pg boundary may have been associated with highly atypical expressions of microbial pathogenicity and the subsequent developments. An atypically large asteroid served as a physicochemical signal, leading to a notable change in the expression of pathogenicity. The asteroid exhibiting characteristics that had not been previously observed. This resulted in a series of vital consequences on a planetary scale. The outcome was a pandemic. A number of species have reached a vulnerable status. However, it is crucial to note that the pattern observed was consistent with the mass die-off of *Saiga tatarica* attributed to environmental contamination with heptyl (*1,1-dimethylhydrazine*) and the occurrence of tularemia linked to glyphosate (*N-(phosphonomethyl)glycine*) (Nikolaenko [2017]).

To comprehend this process, it is essential to utilize the concept of "pure infection" (Nikolaenko [2017]). This represents a natural state where a pathogenic ecotone has emerged, although infectious diseases have not yet manifested. They may not be present. Their existence stems from an incidental interaction between the

EpiGeoSystem (EGS) and specific living organisms. Certainly, it involves documenting the ongoing events. A critical portion of information pertaining to the phenomenon of infection remains unreported. This occurrence is limited to a significantly advanced ecological stage. This is frequently associated solely with health issues in individuals and their animals. All other aspects are overlooked in contemporary epidemiology and veterinary medicine.

The notion of "pure infection" is essential for comprehending the mechanisms behind the emergence of infectious diseases and the factors that contribute to their potential escalation into pandemics or their containment within individual cases. The range of expressions of infectious phenomena is extensive.

In 2021, plans were set up for a systematic analysis of materials pertaining to the Hyper-virulence hypothesis at the K–Pg boundary. Clarification is clearly needed. The subject matter is luxurious and demands meticulous consideration. This matter involves numerous nuances that warrant careful attention. My efforts are being focused on the third volume of "Explaining Pandemics." The initial two were published previously (Nikolaenko [2021], Nikolaenko [2022]). In this context, the hypothesis of an infectious factor contributing to the mass extinction would present a more reasonable explanation. Hypothesis should not be regarded in isolation. It is a logical extension of infectious ecology as an emerging paradigm. It does not include any elements that fall outside of this framework. This represents a further application of the previously established principles, concepts, and cognitive frameworks for formulating and addressing inquiries.

My planning wasn't perfect. Putin and the Russian Federation had something else. On February 24, 2022, a full-scale war began in Ukraine. The regional conflict in eastern Ukraine and the annexation of Crimea (in 2014) have escalated into something similar to what existed during World War II. Life changed again. After a brief period, I was compelled to depart from Kyiv. I found myself in Brno, Czech Republic. Shortly thereafter, I commenced role as a professor at the Faculty of Science at Masaryk University. The research topics have undergone dramatic transformation. I made the modifications personally. The local experts showed no interest in my activities. The project was conducted on two subjects:

- Investigation of the Russian scientific community and its role in the advancement of this military initiative, as well as its direct complicity in the war. This is a vital subject matter. Contemporary geographical science plays a relevant role in military operations. The field of Russian geographical science is closely intertwined with the actions of its assertive state. Following the analysis of this field, more than 100 publications have been made (Nikolaenko [2025]);

- Military Ecology. A novel form of pollution has emerged, presenting a valuable opportunity for in-depth study and analysis. It evolved into an essential requirement of the era. The timely registration of pollutants is crucial for certain types of pollution. It is essential to promptly record all evidence and details at a crime scene, and similarly, conducting analyses swiftly is crucial in cases of military contamination. This subject holds considerable scientific and practical importance. A military ecotone has

been established as a concept. This enables us to monitor environmental changes associated with military pollution at an unprecedented level. The concept holds major relevance for investigating the long-term health impacts of military pollution on living organisms.

The war and forced migration have led to a diminished focus on the essential themes of infectious ecology. The hypothesis regarding the impact of an infectious factor on the mass extinction event at the K–Pg boundary is included. This matter could have been postponed. The occurrence took place 66 million years in the past. During the pre-war period, the latest publication focused on the theory of infectious ecology. The completion date was February 2022. The publication was released at a later date.

The hyper-virulence hypothesis, particularly as it relates to the K–Pg boundary, presented challenges in the publication of the material. The subject appears to be quite unconventional, leading to uncertainty in people's responses. The release of the material was not a viable option.

Another concern is that the journal "Environmental Epidemiology," founded in 2008, is no longer operational. The journal was running smoothly until February 24, 2022. The scientific publication encountered impactful challenges stemming from the influx of millions of refugees from Ukraine, a change in the editor-in-chief's focus, and several other contributing factors. Wars can lead to a significant number of casualties. Including scientific journals.

A new journal was launched in 2025. This has been successfully achieved in the Czech Republic. The journal "Pollution and Diseases" has established comprehensive objectives. The topic of the paleo ecological disaster has demonstrated marked relevance. It is fundamental in nature and necessitates understanding. I am taking this opportunity to publish material that I have previously developed.

The majority of the content in this series of articles was composed in 2021. In 2025, my focus was solely on editing. A comprehensive bibliography has been compiled. Bibliographic references were indeed restored in 2025. It is evident that new publications have been incorporated. In summary, this work spans the years 2021 to 2025, with a pause due to the war and military themes. The duration of the work's creation does not imply it was developed over an extended timeframe. The subject has been addressed at various intervals.

The initial publication regarding this subject was released in mid-October 2025. Concise preprints in both Russian and English have been published (Nikolaenko [2025]). As expected, there was no response. The silence within the scientific community encompasses various nuances. However, the advantage of operating within the new paradigm is that this absence of reaction does not concern you in the slightest. Allow them the necessary time for silence. The recent insights into the pathogenicity of microorganisms and the dynamics of infection present a wealth of new and intriguing information, creating an environment conducive to thoughtful exploration in the absence of expert commentary. I was raised in the USSR and recognize that the responses from the scientific community could have been significantly more severe.

Silence can be beneficial. It is highly advantageous to develop a fundamentally new concept in a quiet environment.

Extinction and Survival at the K–Pg Boundary: An Analysis of Explanatory Factors

The study of the environmental catastrophe at the K–Pg boundary has garnered public attention. Excessive enthusiasm. The current circumstances evoke memories of my observations in the USSR. Numerous statements were made that were, quite frankly, peculiar in their semantic implications. The authors were required to establish either a favorable or unfavorable portrayal of an individual or entity. This was accomplished through strategic communication efforts. There are multiple repetitions and ambiguous semantics of the terms employed.

The narrative surrounding the formation of the image at the K-Pg boundary is quite analogous. The figures "75-25" are reiterated numerous times. Seventy-five percent of living organisms have become extinct. Twenty-five percent of the subjects survived. It is occasionally noted that these figures are derived from a minimal sample, clearly representing less than 1% of the living organisms from that period.

The uncertainty surrounding such specific and often reiterated figures (75-25%) is not the primary cognitive challenge in examining the mass extinction at the K-Pg boundary. The selectivity of the "Alvarez meteorite's" impact on the mass extinction involves significantly more complex issues that require thorough explanation. A more intensified iteration of the conventional issue regarding the validity of a "scientific explanation" emerges. How adequately do current explanations for the mass extinction at the K–Pg boundary align with the criteria of scientific research? What is the level of accuracy in our analysis of this scientific problem?

To what extent does the expert community strive to understand the meta-scientific justification for their professional activities? Is this authentic scientific research or simply a spectacle intended to garner maximum social media engagement? A common perception arises concerning the portrayal of a scientist. It signifies the fusion of a youngster profoundly engrossed in a concept and an adult wholly captivated by the quest for comprehension of their surroundings. The portrayal of a scientist in the context of investigating the environmental disaster at the K–Pg boundary is significantly compelling. Several folks are interacting with the camera, demonstrating a genuine curiosity while showcasing dinosaur fossils. This is often associated with Montana, a U.S. state that encounters economic difficulties and is noted as a prominent location for dinosaur discoveries. This signifies a culture of fervor and zeal. To what extent does it align with the expert community's commitment to preserving the integrity of scientific knowledge, rather than simply participating in the enthusiasm surrounding "dinosaurs"? It is difficult to ascertain. The differentiation has become quite ambiguous.

Formulating the research question accurately is the foundational step of the study

Prior to exploring the living and the dead at the K–Pg boundary, it is essential to outline the process for developing a scientific question. The information available is both excessive and insufficient. This is a frequently encountered scenario. It is

essential to not only evaluate the comprehensive body of information regarding all fossils but also to clearly articulate your cognitive interests and objectives. Additionally, to establish the theoretical and methodological foundations for conducting research on the environmental catastrophe at the K-Pg boundary. Similar to how a surgeon must not enter the operating room in casual clothes with dirty hands, it is essential to thoroughly examine the meta-scientific foundations of an expert's work before engaging with such a complex topic.

The development of the K–Pg Hyper-virulence hypothesis starts with a comprehensive formulation of cognitive objectives and a clear elucidation of the theoretical and methodological foundations necessary for their attainment. These are just examples at this stage.

I am keen to learn about all the biological species that were present on the planet during that period. The focus extends beyond merely "dinosaurs," which tends to be the prevalent subject for attracting funding or garnering huge attention on social media. The volume of information regarding paleo events and the manner in which it is presented in scientific journals, alongside the increased focus on the subject in media and public awareness, varies significantly.

It is essential to distinguish between various habitats. Consider terrestrial, as well as marine and freshwater species. Individuals who have traversed the air are also part of the surface. It is essential to recognize that we are discussing a past that is so remote that it was markedly different from contemporary existence and what is frequently regarded as the "norm." This is highly essential when organizing experimental work to validate the K–Pg Hyper-virulence hypothesis.

One can consider the atmosphere and the distinctions between its current state and that of the K–Pg boundary. The atmosphere of Earth 66 million years ago, at the conclusion of the Cretaceous period, exhibited considerable differences compared to its current state. Variations in chemical composition, structural attributes, and climatic conditions. This period was characterized by a warm, humid climate, elevated levels of greenhouse gases, and the lack of polar ice sheets (Table 1).

The global average temperature was 8–10°C higher than the current levels. The polar regions lacked permanent glaciers, supporting the growth of coniferous and flowering plants. The temperature gradient between the equator and the poles was reduced. The climate exhibited greater uniformity. The overall atmospheric pressure was probably near contemporary levels (within ± 10%), but elevated CO_2 and water vapor resulted in a denser, warmer, and more humid troposphere. The warm, oxygen-rich atmosphere facilitated the gigantism of various animal groups, including dinosaurs, pterosaurs, and marine reptiles.

This serves as a demonstration. Currently, there are no detailed specifications available. However, they can and must be acquired during the planning phase of the experimental verification of the K-Pg Hyper-virulence hypothesis. Information is available for acquisition.

A variety of studies address the key aspects of atmospheric and climate research related to the Chicxulub impact. The data from this study have limitations. Fallibilism declares that achieving a perfect scientific endeavor is unattainable. Not applicable to either experimental or theoretical domains. All theories have their shortcomings, and every experimental endeavor is subject to certain limitations (Peirce [1931–1935], Peirce [1877], Dewey [1938], Hook [1950], Rescher [2005], Haack [1993], Misak [1991], Ayer [1956], Chisholm [1977], Audi [2010], Moser [1989], Hetherington [2001]). It is essential that the development of the K–Pg Hyper-virulence hypothesis fully considers the variations in the planet's nature across different time periods. The research concerning the ecological catastrophe at the K–Pg boundary should transition from sensationalism and the ongoing disputes among scientific groups, who have already expressed their views to one another, to a more advanced stage of discourse.

Component	Late Cretaceous (approximate)	Modern atmosphere	Remarks
CO_2 (carbon dioxide)	800–1,200 ppm (some estimates up to 1,500 ppm)	~420 ppm (2025)	Roughly 2–3 times higher than today, due to intense volcanism (Deccan Traps) and reduced carbon burial.
O_2 (oxygen)	26–30% by volume	20.95%	Higher oxygen promoted frequent wildfires and supported large-bodied animals.
CH_4 (methane)	Likely elevated, ~2–5 ppm	~1.9 ppm	Produced by extensive wetlands and shallow epicontinental seas.
N_2 (nitrogen)	~78%	~78%	Dominant gas, essentially unchanged.
Aerosols and dust	Elevated SO_2 and volcanic particles, especially before the K–Pg boundary	Low background except during eruptions	Mesozoic volcanism contributed to a hazier atmosphere.

Table 1. Variations in the characteristics of the contemporary Earth's atmosphere compared to those at the K–Pg boundary. Compiled from various sources of information from multiple publications (Beerling et al [2002], Berner et al [2001], Bardeen et al [2017], Kaiho et al [2016], Ohno et al [2014], Toon et al [2004], Pierazzo et al [1998], Pope et al [1994], Toon et al [1982], Schulte et al [2010], Vellekoop et al [2019]).

Theoretical Geography of Infectious Diseases

While the patterns of discrete activation of the pathogenic properties of microorganisms may remain consistent, the specific processes involved in the development of infectious diseases, particularly in the context of pandemics, can vary considerably.

The discussion focuses on physicochemical signals as the fundamental source of pathogenicity generation. We may be discussing relatively minor gradients. This is demonstrated through field research on plague morbidity in natural settings. Ecotones hold key importance in the field of geography. A natural ecotone is consistently linked to minimal gradients. Figure 1 provides an illustrative example.

This figure 1 represents the measurement in meters. 0, 50, 100, and 200 meters. The research data was collected long time ago, and there is a potential for the introduction of new scales. It is important to note that there exists a potential for addressing what has been referred to as the "negative cartographic scale." A distance of 1 centimeter is represented by a smaller measurement.

Ecotones influenced by invasive physicochemical factors can exhibit significantly more dramatic gradients. This is illustrated by the case of fatal pasteurellosis and its effects on Saiga tatarica. Nonetheless, a comprehensive understanding of what was regarded as "normal" during that period is essential. The physicochemical signal that produces manifestations of pathogenicity can be comprehended solely within the framework of the norm. The standards at the K–Pg boundary were markedly distinct.

Further clarifications regarding the question are required. This article serves as an introduction, and I will confine my discussion to this particular example. The examination of the selectivity of the mass extinction event at the K–Pg boundary relies on a variety of information sources. The aspect of selectivity raises pivotal concerns within contemporary theories regarding the ecological catastrophe at the K–Pg boundary.

This type of search yields a substantial amount of information concerning the individuals who survived and those who did not. I will not incorporate those lists into the article. These matters are relatively minor and are readily available in numerous previously published sources. The works presented vary in complexity, yet they utilize similar data sets. A prevailing rationale exists in the formulation and resolution of inquiries.

In conclusion, it is essential to note that formulating the hypothesis verification question is a critical and often time-consuming process. I completely comprehend this and am prepared to take all necessary steps to articulate the K–Pg Hyper-virulence hypothesis with the utmost precision. An in-depth examination of the processes and methodologies associated with the Alvarez hypothesis serves a specific function, albeit one that is predominantly unfavorable. This is an action that should be avoided at all costs. Epistemology has outlined the criteria for scientific knowledge, and there is no justification for diverging from these standards in relation to the K–Pg Hyper-virulence hypothesis.

Plausibility as a Basis for Explanation

A substantial amount of information regarding paleo events and their explanations is readily available. The most concerning aspect is that the scientific explanations provided are of a "plausible" nature. Nothing beyond that. Their primary attribute is as follows. These do not constitute scientific explanations. While they may appear in prestigious scientific journals boasting high impact factors, they fail to adhere to the

standards of scientific rigor. The criteria of scientific validity were not established by us, nor is it within our authority to eliminate them.

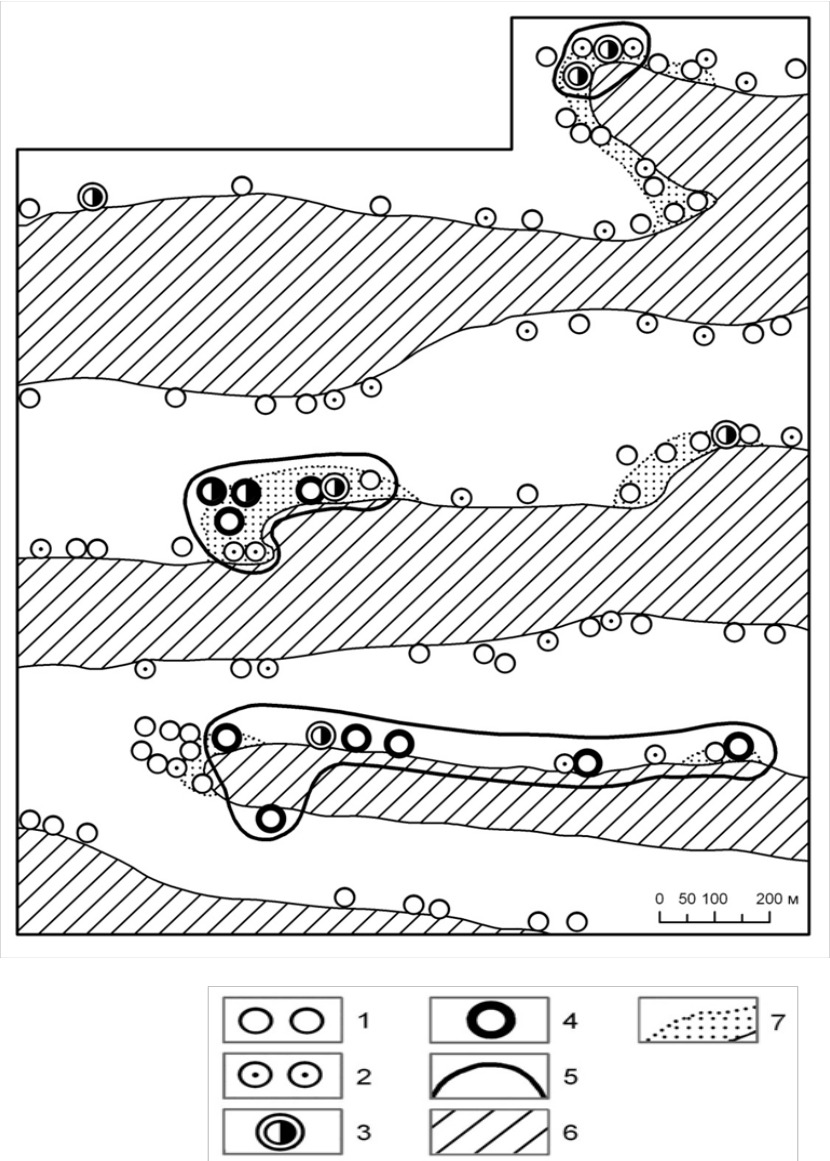

Figure 1. Plague burrows in ribbon settlements of large gerbils along wet salt marshes (Tenteksor area, November 1966) (Rothschild [2011]). 1 – Habitable burrows of large gerbils; 2 – burrows not inhabited by animals; 3 – burrows with gerbils infected with plague; 4 – burrows with plague fleas; 5 – conditional boundaries of foci; 6 – wet salt marshes – sors; 7 – loose sandy deposits; unshaded areas – clay ridges (Berov hills).

Illustrations. The survival of amphibians (Amphibia), insects (Insecta), and arachnids (Arachnida) at the K–Pg boundary is beyond doubt. Paleontological data indicate that the diversity and abundance of frogs and salamanders remained stable at the K–Pg boundary, particularly in North America. What is the reason for this situation? How is this possible? An explanation is provided. The primary scientific explanations for the survival of these specific groups during the mass extinction are as follows:

Amphibians (Amphibia: Anura, Caudata). The majority of contemporary amphibians, including frogs, toads, newts, and salamanders, were present during the Cretaceous period and successfully endured the catastrophic events of that time. Potential factors:

- Existence in aquatic or moist surroundings. A substantial number of amphibians predominantly inhabit aquatic environments or reside beneath moist soil layers. This safeguarded them against heatstroke, fires, and the climatic disruptions resulting from the asteroid impact.

- Capability to conceal. A variety of species possess the ability to burrow into the ground or conceal themselves within burrows or dens. This safeguarded them from excessive heat, shock waves, and environmental contaminants.

- Minimal energy consumption. Amphibians, being cold-blooded creatures, exhibit a low metabolic rate, allowing them to endure extended periods without sustenance. This holds vital relevance in the context of food chain collapse.

- Development in a moist environment (eggs submerged in water). Amphibians do not rely on the continuous availability of terrestrial vegetation for reproduction, in contrast to numerous other species. Their larvae consume microscopic organisms that may have rapidly rebounded following the impact.

Insects, including beetles, ants, bees, and others:

- Limited area with a considerable concentration of inhabitants. Insects exhibit a high degree of abundance and possess brief lifecycles, facilitating the swift regeneration of their populations.

- A range of dietary options. Insects consume a wide range of materials, including dead organic matter, fungi, spores, manure, wood, other insects, and even air in the form of pollen. A relevant number of these resources have been maintained or have rapidly regained their status.

- Stages of rest (diapause, pupa, egg). Numerous species are capable of surviving for prolonged durations in a dormant state, withstanding adverse conditions.

- Shelters and microhabitats. A variety of insects inhabit soil, bark, wood, or burrows, providing them with protection against fire, cold, and acid rain.

- Pollinators and scavengers. Despite the extinction of numerous flowering plants, the surviving species commenced blooming anew after a few thousand years. Pollinators, including ancient bees, have the potential to adapt rapidly. Scavengers, including burying beetles and flies, were able to access the carcasses of animals that succumbed during the disaster.

Arachnids (Arachnida: including spiders, mites, and scorpions):

- Soil and concealed forms. The majority of arachnids inhabit leaf litter, soil, or burrows. These environments effectively mitigate external changes such as temperature, radiation, and acidity.

- Minimal food requirements. Arachnids have the ability to survive extended periods without food, with certain spider species capable of enduring for up to a year. This adaptation is crucial in environments where food resources are severely limited.
- Resilience against vegetation degradation. A variety of arachnids engage in the predation of small insects. The high survival rate of insects has enabled arachnids to sustain their position at the base of the food chain.
- Cosmopolitanism and Adaptability. Arachnids were prevalent and occupied a variety of climates and environments. This ecological and geographical adaptability played a

The final conclusion is entirely logical. The shared factors contributing to the survival of all three groups included:

- Compact size;
- Capacity to conceal themselves or dig;
- The capability to hibernate or reduce metabolic activity;
- Consumption of decomposing material or basic life forms.
- Autonomy from complex or specialized environments.

Their resilience to the consequences of the asteroid impact was ensured by these traits, which included global fires, acid rain, cooling, and the collapse of photosynthesis, as well as other phenomena reported in scientific literature and understood by individuals over the age of five.

This scientific explanation is plausible. Everything aligns perfectly. Any argument can be concurred with. The argument is presented in a manner that makes it challenging to disagree with it. However, what is the relevance of all this to the events that occurred at the K-Pg boundary? What is the basis for our extensive knowledge of details that have been scientifically published numerous times and presented widely in popular media?

Serious scientific studies have been conducted based on this "plausible" premise. A compilation of the most frequently referenced scientific publications focused on the survival and extinction of amphibians, insects, and arachnids during the Cretaceous-Paleogene boundary (Alroy et al [1998], Labandeira et al [1993], Longrich et al [2012], Wilson [2013],Vajda et al [2004], Archibald et al [1990], Vellekoop et al [2014], Robertson et al [2004], Schulte et al [2010], Fastovsky et al [2005], Brusatte et al [2012], Hallam et al [1997], Barnosky et al [2005], Clemens [2002], Raup et al [1982], MacLeod et al [1997], Jablonski et al [2006], Wang et al [2006], Archibald et al [1997], Labandeira et al [2013]). The quantity of links can be augmented by any multiple.

I have complete confidence in the sincerity and expertise of the authors mentioned, and I analyze their work through the lens of the infectious ecology paradigm. The evaluation is conducted from the standpoint of epistemology. This matter holds significant importance. I am analyzing the current body of knowledge regarding the environmental crisis at the K–Pg boundary from two distinct perspectives. In the field of

epistemology, there exist defined and thoroughly established criteria for scientific knowledge. The authors' reasoning is clear; however, it remains unconvincing. Considerations supporting René Descartes' concept of "universal doubt" and its relevance to this particular situation.

The shift from plausibility to scientific explanation involves a high degree of complexity. Plausibility is well-supported by established scientific paradigms and various characteristics associated with scientific rigor. An exemplary case pertains to the declaration of “species – reservoirs” serving as the foundation for the periodic emergence of infectious diseases. Numerous infectious diseases are associated with specific “species – reservoirs”. They frequently encounter each other. The overlaps occur because the method of "scientific explanation" is not a determining factor. This does not adhere to established scientific standards of explanation. It is merely a compilation of words and nothing beyond that. However, it is essential to comply with the established standards of scientific rigor. Verification of its scientific validity will be provided by “independent reviewers” and recognized scientific organizations.

The discussion surrounding the COVID-19 pandemic included compelling examples. All the same “species – reservoirs” (Wong et al [2020], Zhang et al [2020], Liu et al [2019], Perveen et al [2021], Wahba et al [2020], Ghareeb et al [2021], Hassanin [2021], Li et al [2021], Sahu et al [2021]). What is the reason for this practice? It is essential to examine the details of the operations within the scientific community. It can be asserted that we have transitioned from Thomas Kuhn's concept of "normal science" to that of "super-normal science." Super-normal science represents a key achievement in terms of plausibility.

Two novel ideas.

"*Scientific society in a state of status quo*" and refer to it using the abbreviation SS-SQ. The reaction of SS-SQ to a scientific novelty is determined not so much by its cognitive value and level of development in strict accordance with the requirements for scientific knowledge in epistemology, but rather by the threats to the stability of SS-SQ. It represents a consistently irrational response. A pivotal contradiction emerges between scientific and cognitive activities, as scientific endeavors increasingly lack cognitive frameworks and focus exclusively on reproducing the prevailing paradigm. However, this does not concern SS-SQ, as it views such a standard as entirely normal.

"*Implicit bunker of normal science***."** The current framework of concepts and terminology within the science of science is inadequate for a comprehensive scientific explanation of the active and effective resistance exhibited by the scientific community towards novel ideas. This phenomenon exhibits remarkable persistence and complexity. A considerable amount of data exists concerning numerous instances of categorical and highly irrational denial of scientific innovations, particularly within the scientific community.

A novel concept that elucidates the resistance of the scientific community to innovations is the "implicit bunker of normal science." I do not assert ownership of

this term; however, I am not familiar with any publications that utilize it. The implicit bunker of normal science refers to a contradictory and speculative framework of reflection that enables proponents of normal science to uphold the status quo, which they regard as an ultimate objective and value. To maintain the current state of affairs, representatives of normal science are prepared to undertake extensive intellectual efforts within their scientific domain. Depending on the specifics of the state and society, this system of reflection may also entail repressive measures against individuals who seek to alter the status quo and promote scientific advancement.

To comprehend the underlying framework of normal science, it is essential to reflect on the writings of Franz Kafka. This world presents a striking array of contradictions and surreal elements, characterized by unexpected sequences, connections of arguments and facts, and illogical relationships between the declarative and actual activities of the scientific community. Science positions itself as the pinnacle of rationality; however, the normal scientific community often presents contradictions to this assertion. The underlying assumptions of normal science serve as evidence of the illogical behaviors exhibited by many scientists (Nikolaenko [2025]).

Formulating the research question accurately is the foundational step of the study

There is not a single second of doubt that Crimea is generating a scenario comparable to that of contemporary Iran and its capital, Tehran—that is, the entire peninsula will face catastrophic freshwater scarcity. This will occur “unexpectedly.” Yet this “unexpectedness” has been approaching for nearly a century. Periods of intense warfare and mass violence have played a decisive role in shaping this trajectory.

What constitutes a scientific fact? What data do specialists utilize while investigating the environmental dilemma at the K–Pg boundary?

An empirical fact inherently carries theoretical implications, as it is accompanied by an interpretation. A fact extends beyond mere discovery. An artifact or fossil, such as the Champsosaurus tooth mentioned above or the absence of dinosaurs at the K–Pg boundary. That is not a fact; it is an observation. A scientific fact is established solely within the framework of a specific theory. Scientific facts cannot exist independently of theory. Various theories exist within the fields of geochronology, biostratigraphy, systematics, and ecology. They establish the foundation for transforming observation into scientific fact. In the absence of theoretical frameworks regarding the deposition of layers, the impact of migrations on species distribution, and the processes through which ecosystems recover and undergo specific types of succession, any findings lack critical meaning. From this, one can create various assertions, though they will possess limited scientific merit.

A collection of artifacts related to the K–Pg boundary is presented here, along with essential information regarding them. The presence of the Champsosaurus tooth, or the lack of dinosaurs above the K–Pg boundary, is unequivocal. The inquiry at hand is how to establish all of this as a scientific fact. This information must develop into a scientifically validated fact.

In the realm of Russian scientific discourse, a distinct differentiation exists between the object of research and the subject of research. An object is reality. The focus of research pertains to what is delineated by scientists and what is currently being examined through a scientific lens. It can be described as a segment of reality, characterized by a well-established scientific methodology. The subject of examination can be analyzed from various viewpoints. The number of research subjects may possess a specific variety of characteristic. This matter holds significance as there may be competition among various scientific methodologies, despite the fact that they pertain to distinct areas of knowledge. An illustration of this type of narrative can be found in the research of infectious diseases during the latter part of the 19th century.

There may be some ambiguity in the terminology and translations involved. In English methodology, the division is not as rigid as in Russian, but it can be expressed as follows:

- I translate "Объект исследования" as "Object of the study" or "Object of research."
- "Предмет исследования" as "Subject of the study," "Subject matter," "Research focus."

A theory comprises a framework of interrelated concepts, laws, and models that elucidates various observations and facilitates predictions. Theories may vary. The object of examination can be depicted as reality. It exhibits numerous forms. An extensive and evolving collection of information. Consequently, research topics are developed. Each scientific theory is associated with a specific area of investigation. This theory's effective application is also linked to him. Once we move past this topic and explore a different cognitive area, the theory's effectiveness may drastically diminish. This occurrence is frequent due to the lack of clearly defined areas for reconciling theories. They assert universality, yet they fall short of that claim.

A substantial portion of the information pertaining to the explanation of the mass extinction at the K–Pg boundary cannot be regarded as established scientific facts. For instance, no dinosaurs were discovered above the K–Pg boundary. Their extinction resulted from a catastrophic event. It is noteworthy that frogs and turtles inhabit the area above the layer. Consequently, they persevered. Analysis: resilience to stress, aquatic habitat, reduced body weight. A variety of observations and their interpretations can be referenced. We typically apply interpretations to this type of observation retrospectively. They should not be regarded as scientific (empirical) facts. This lacks any theoretical framework. A specific quantity of plausible terminology must be articulated to formulate a "scientific explanation."

Is it possible for a substantial amount of these observations to alter the cognitive situation and advance our understanding of the scientific explanation for the ecological catastrophe at the K–Pg boundary?

Negative. That is not acceptable. Let us consider the scenario in which all fossils on this planet have been discovered and, as it seems, are associated with the K–Pg boundary. The entire state of Montana in the USA was excavated. Will this help us better

understand why such fossils are absent above the K–Pg boundary? Negative response. The issue lies not with the fossils or their abundance. The issue is engaged in the cognitive framework that currently leads research on the environmental crisis at the K–Pg boundary. A transition from isolated artifacts to their theoretical explanation is necessary. In Montana, you can't dig up a theoretical explanation.

Another aspect must be considered when examining the environmental catastrophe at the K–Pg boundary. This pertains to the dynamic nature of the object of study. He has the potential for change. An illustration can be the data presented regarding the distinctions between the atmosphere at the K-Pg boundary and the contemporary atmosphere (Table 1). They are distinct. The object exhibits dynamic characteristics. The dynamics may present surprises for contemporary observers. The theory remains consistent. It was established initially and continues to evolve. This development typically adheres to the principles outlined in Thomas Kuhn's concept of "normal science." A paradigm is established, leading to the reiteration of previously articulated concepts. An advocate of this stable paradigm, grounded in theory, tends to focus more on their scientific adversaries than on the actual reality. They have the capacity to sustain this condition for an extended period.

This is especially clear in the case of theories concerning dynamic objects. Consider the relationship between the state and society. Sample: During the mid-19th century, Marxism emerged as a social and economic doctrine. They meticulously and thoughtfully articulated the dynamics of development and provided forecasts accordingly. They were linked to revolutionary movements of the working class. However, the object has undergone a transformation. There are no proletarians as defined by Marx and Engels. All circumstances have transformed. The initial theory ceased to evolve and transformed into an ideology. It was presented numerous new versions, with nearly all exhibiting a nationalistic perspective, including those influenced by Soviet, Chinese, and various other ideologies.

The situation concerning natural objects is relatively stable; however, it is essential to consider the contradictory nature of the research subject and its scientific characterization as a focus of study. Particularly when discussing events that occurred millions of years ago and a subject that is continually evolving in research.

This situation is occurring and is directly connected to established scientific facts. For a dynamic object and its scientific comprehension, it is essential to maintain accurate documentation of relevant facts. To what degree can this be achieved when examining the ecological catastrophe at the K–Pg boundary?

The logical conjunction of various micro-hypotheses in the examination of the environmental catastrophe at the K-Pg boundary

The examination of the environmental crisis at the K-Pg boundary is characterized by the "age of conjunction." The term "conjunction" refers to any connection, combination, or coincidence of elements, including ideas, phenomena, and processes. The interpretation of a term is contingent upon the specific domain in which it is applied.

The examination of occurrences at the K–Pg boundary presents a distinct interpretation of the conjunction.

Contemporary interpretations of the environmental crisis at the K–Pg boundary rely on the integration of various micro-hypotheses. A diverse range of research topics has been developed. The presence of numerous paleo artifacts and fundamental details regarding them effectively aids in the formulation of these micro-hypotheses. They are quite intriguing. They possess a remarkable sense of humor. They can embody decades of an expert's dedication and effort. The core of the micro-hypothesis remains unchanged despite this development. The focus is on conjunction and seeks to clarify a particular segment. The foundation is primarily established on standards rather than being heavily reliant on scientific research, focusing instead on heuristic approaches. The broader scientific context is not well comprehended. This represents the resolution to the puzzle. It does not necessitate a broader scientific comprehension of the natural process.

Puzzle tasks are typically interpreted through the lens of Thomas Kuhn's concept of paradigms. A stable paradigm is currently established. All inquiries are addressed within it. This paradigm demonstrates consistent reproduction. It is essential to emulate progress and address challenges effectively. They do not present any risk to the established framework. Paradigm embraces this direction of development. In such a situation, it is entirely reasonable to completely overlook scientific innovations or even to actively seek them out. A specific iteration of a safari designed for scientific outliers, endorsed by advocates of prevailing paradigms.

Puzzle-solving tasks are present due to the lack of a widely recognized paradigm that would enable the scientific community to move towards the phase of "normal" science as typically understood. This situation is distinct. Addressing issues within a specific segment while lacking a comprehensive understanding of the overall context. Certain hypotheses, including the Alvarez hypothesis, are often elevated to the status of a theory without sufficient justification. They represent a form of replication of theoretical frameworks and paradigms. The theoretical gap has been addressed, allowing for the development of micro-hypotheses. They are capable of offering employment opportunities for specialists for an extended duration as required. The expert community is currently in a favorable position, allowing for enthusiastic engagement in their regular activities. Discovering an increasing number of fossils. This cognitive scenario establishes a unique scientific community.

There is no definitive theory that convincingly explains why, for instance, birds survived while pterosaurs did not. Rather, there exists a collection of "local" hypotheses:

- A lower body weight can be beneficial. What is the reason for this? Concealment is more straightforward. However, the same observation applies to exceptionally large beings. Are we discussing an air wave that encompasses everything in its trajectory? If that is your intention, then our discussion should focus on the benefits of the flat shape rather than the lightweight aspect.

- The capacity to consume seeds presents a vital benefit. What is the reason for this? Feeding is more probable once the vegetation has diminished. What is the expected duration of this gastronomic map? If the environmental disaster was as momentous as depicted in scientific literature and illustrated on YouTube, ecological successions would not have occurred at all. Should one consume seeds for a duration of 400 to 1000 years?

- The existence of aquatic stages offers a vital benefit. What is the reason for this? Freshwater provides refuge from the unfolding crisis. An excellent scientific explanation. Land dinosaurs, weighing tens of tons, are propelled by an unprecedented air wave resulting from the Alvarez meteorite impact, while frogs, weighing merely a few grams, find refuge in a freshwater pond that ranges from 30 to 100 centimeters in depth. That is the reason for their survival.

The quantity of these “local” hypotheses can be extensive, limited only by your preferences. This marks the period of localized hypotheses. The identification of an additional fossil exhibiting atypical characteristics will not perplex the expert community. A series of local hypotheses will be generated immediately. A new collection of publications will be released in prestigious scientific journals. New scientific knowledge will be developed. It will promptly transition to YouTube, making it available to a vast audience.

The commonality among these local hypotheses lies in their nature as post hoc explanations, formulated solely after the outcomes of survival or extinction have been determined. This diminishes their scientific significance. Popper's criterion lacks significance and does not merit discussion. This type of scientific research is entirely unsuitable. This criterion seems to have been overlooked by many.

To comprehend the circumstances surrounding the environmental catastrophe at the K-Pg boundary, it is essential to consider the existing body of knowledge in epistemology. In the fields of linguistics and analytic philosophy, conjunction is recognized as a fundamental method for linking judgments into a unified statement. It conveys more than a mere mechanical “and”; it signifies a cognitive connection of meanings. The meanings are established by individuals based on various systems. The result may vary significantly. When this is backed by the authority of a scientific paradigm that generates such a synthesis of meanings, new "scientific knowledge" arises.

In the philosophy of language, conjunction serves as a framework for how individuals develop a comprehensive understanding of the world from various fragments of experience. In Wittgenstein's Tractatus Logico-Philosophicus, conjunction is viewed as a method for linking “atomic facts” to form a complex statement. This illustrates the formation of the “world picture” within language (Russell [1914], Russell [1918], Wittgenstein [1922], Ayer [1936], Ramsey [1927], Hochberg [1978], Armstrong [1997], Livingston [2001], Linsky [2003], Bostock [2012], Elkind [2018]). In the examination of occurrences at the K–Pg boundary, they established their own criteria for linking “atomic facts” into “complex statements”. Such perspectives can exhibit internal consistency. The criteria upon which they are being constructed is a separate consideration.

I acknowledge that earlier publications in epistemology are referenced. However, the emergence of this epistemological knowledge decades ago does not warrant its dismissal. Should scientific reflection be compelled to commence at the level of conjunction, it is imperative that this is comprehended with the highest degree of clarity. The significance of the logic of science is paramount at this stage of research. Individuals specializing in the environmental catastrophe at the K-Pg boundary should possess a deep understanding of scientific principles, rather than solely focusing on fossil discovery and their correlation with the Alvarez hypothesis or similar ideas. In the referenced literature regarding the interpretation of survival or extinction at the K-Pg boundary, I do not observe any such information. The work standard is predominantly characterized by individuals who are passionate about discovering fossils, articulating their findings, and developing broader theoretical frameworks. Their relevance to the body of knowledge in epistemology and the logic of science concerning conjunction is non existent. The prevailing research standard in this field does not necessitate any understanding of epistemology. Various standards can be established for integrating "atomic facts" into complex statements. Conjunction facilitates complex cognitive processes. This does not represent a well-developed diversity of scientific viewpoints as an ideal condition. It remains a conjunction. Its cognitive potential is significantly constrained.

A more comprehensive indication can also be provided regarding the sections on conjunction that are most essential for the study of events at the K-Pg boundary (Table 2.).

Author / References	**Publication**	**Sections / Notes**
Frege (1879)	*Begriffsschrift*	§§2–9 — first symbolic definition of conjunction as a binary operation.
Russell (1903)	*Principles of Mathematics*	Ch. VII–X — conjunction and disjunction as truth functions.
Russell & Whitehead (1910)	*Principia Mathematica*	§2.01–§4.3 — formal calculus; definition of $p \supset q$.
Wittgenstein (1921/1922)	*Tractatus*	§§4.4–5.11 — conjunction as truth-function; basis of logical form.
Wittgenstein (1953)	*Philosophical Investigations*	§§19–38 — shift from formal logic to language-use perspective.

Table 2. An in-depth analysis of logical conjunction as presented in foundational texts on epistemology.

Can it be asserted that this represents a considerably outdated body of scientific knowledge? Are the previously articulated concepts regarding the logic of science still considered valid?

Negative response. Below are several examples of more modern works that explore a similar theme:

- Quine W V O. – Chapter II discusses conjunction within classical propositional calculus and traces its formal roots to Frege and Russell (Quine [1940]).
- Dummett M. – Comprehensive analysis of Frege's semantics of complex sentences, including his account of conjunction as truth-function composition (Dummett [1973]).
- Dummett M. – Examines Frege's logical connectives and their role in the compositional structure of thought (Dummett [1981]).
- Anscombe G E M. – Clarifies Wittgenstein's treatment of conjunction (Tractatus §§4.4–5.11) as a truth-operation over elementary propositions (Anscombe [1959]).
- Kenny A. – Explores the continuity between Russell's logical atomism and Wittgenstein's account of conjunction and other logical operators (Kenny [1973]).
- Pears D, McGuinness B F, eds. – Includes commentary on logical connectives and their semantic function in the Tractatus (Pears [1993]).
- Monk R. – Provides historical background on Russell's collaboration with Whitehead and the evolution of his views on logical conjunction (Pears [1993]).
- Glock H-J. A – Entry "Conjunction" summarizes Wittgenstein's changing interpretation of "and" from formal logic to language-use (Glock [1996]).
- Soames S. – Surveys how Frege, Russell, and early Wittgenstein established conjunction as a purely truth-functional connective (Soames [2003]).
- Marion M, Okada M, eds. – Contains essays linking Frege's and Russell's formal definitions of conjunction to later developments in proof theory (Marion [2012]).
- Beaney M. – Provides annotated excerpts from Frege's Begriffsschrift and related writings explaining his original notation for logical conjunction (Beaney [1997]).

I would like to emphasize that this pertains to established knowledge. This is not utilized in the examination of the ecological catastrophe at the K–Pg boundary. The conjunction is clearly dominant; however, its comprehensive examination at the epistemological level has not been extensively employed. The principles of earlier scientific thought prevail. The contributions of experts in logic to this field of research are notably absent. This serves as assurance that all matters will proceed consistently. This scientific community, established upon a specific micro-paradigm and its unique cognitive standards, vigorously upholds its prerogative to overlook epistemology. Numerous instances of this nature exist. They are also connected to the examination of the environmental crisis at the K–Pg boundary. A comparable scenario is present in various scientific disciplines associated with the exploration of nature.

This inquiry was examined thoroughly via the lens of the evolution of geographical science in the USSR and the post-Soviet era (Nikolaenko [2025]). This is typically elucidated by the prevalence of Marxism-Leninism and the impact of ideology on

geographical science. A comparable scenario is present in geographical science across numerous other nations. An illustration might be the advancement of geographical science in Anglo-Saxon nations globally. Numerous instances of this nature can also be observed there. They are partially described in D. Harvey's book (Harvey [1969]).

The prevalence of heuristics compared to theoretical explanations

A notable aspect of the body of publications regarding the environmental catastrophe at the K-Pg boundary is the overwhelming presence of heuristics. This represents a highly atypical scenario within contemporary scientific discourse. It is challenging to recall any other area of scientific research where a comparable situation occurs. Survival, regarded as a “ecological sieve”, is a standard heuristic rather than a formal theory. This represents a foundational thesis. It is unfortunate that this matter is not addressed in a systematic manner.

The primary cognitive challenge lies in the absence of a clear formulation regarding the transition from heuristic approaches to theoretical frameworks. Without a clearly defined task and a proper understanding of the current state of this area of scientific research, a transition will not occur. It is likely that numerous specialists, along with a prominent number of dinosaur enthusiasts across different age groups, may not completely grasp the subject matter being addressed. Their objective is to identify new fossils. The larger the finding, the more intriguing it becomes. It became evident that size plays a crucial part.

The idea that species exhibiting specific ecological strategies, such as omnivore, small body size, and an aquatic lifestyle, managed to survive appears credible; however, it lacks adequate integration within the framework of evolutionary theory. A definitive scientific model that accurately predicts survival probabilities under these conditions, incorporating specific biological details, does not currently exist. We observe correlations; however, causal relationships are not consistently present.

If catastrophic periods indeed present numerous opportunities for species possessing the aforementioned characteristics, how does this correspond with the events that transpired before and after the ecological catastrophe at the K–Pg boundary? Numerous inquiries can and ought to be developed from a theoretical perspective, rather than relying on a heuristic approach. It appears that there is a lack of comprehension regarding this matter. A critical cognitive disparity exists. It receives ongoing support from the recognized expert community. The focus is directed towards the public and serves as a demonstration of reliance on its own perspectives.

The current circumstances bear a resemblance to developments occurring within the realm of political science. The gap between scientific research and an expert's public contributions is minimal.

An exceptionally compelling argument supporting the infectious hypothesis is that this biodiversity factor lacks logical coherence. This does not align with any other established body of knowledge. This represents an alternative aspect of nature's organization that intermittently influences the biota. A distinctive physicochemical signal has emerged. An event occurred that resulted in the microorganisms becoming

pathogenic. After that, someone was gone. There exists a regular overlap between the assessment of biota and the evaluation of microorganisms that are starting to demonstrate their pathogenic characteristics. This crossing is unrelated to the events that occurred previously in the biota.

A considerable number of compelling and scientifically grounded explanations exist regarding the evolution of species. One may begin with Charles Darwin. His work is exceptional. However, it is crucial to recognize that regardless of how one articulates species competition, their adaptation, and various other factors, the intersection with the realm of microorganisms displaying pathogenic properties is entirely unprecedented for members of the biota. The issue at hand involves a phenomenon that is characterized by a) discreteness, b) infrequency, and c) substantial variability. It is not feasible to adjust to that situation.

I have to provide an essential clarification regarding the relationship between heuristics and scientific theory. It is generally inappropriate to include such statements in scientific literature; however, the circumstances surrounding the research on the environmental catastrophe at the K–Pg boundary are indeed peculiar.

Heuristics, derived from the Greek term heurisko, which translates to "I find, I discover," serves as a method for problem-solving, a guiding principle, and a strategy for navigating unfamiliar circumstances. Heuristics assist in identifying a pathway; however, they do not inherently offer a scientific rationale. Heuristics outlines the process for searching, rather than explaining the rationale behind its configuration. A theoretical explanation consists of a network of interrelated statements that elucidate and forecast phenomena, grounded in a structured body of scientific knowledge. This "system of scientific knowledge" is consistently associated with specific paradigms. However, it is crucial to understand that this situation does not involve a determination based on plausibility.

Table 3 illustrates the primary distinction between the heuristic and theoretical approaches.

Criterion	Heuristic approach	Theoretical Approach
Goal	To find a solution, formulate a hypothesis, or generate an idea. Once a solution is identified, the primary objective typically involves either a) its extensive promotion or b) transitioning to a new challenge. The media can be utilized with composure and assurance. The popularity of a YouTube channel may serve as an indicator of the validity of the proposed solution.	To clarify, organize, and anticipate. This must be executed in accordance with a framework of scientific understanding. All established criteria for defining scientific knowledge are applied. Internal consistency, Popper's criterion, and additional relevant concepts. The involvement of the public in the research process is minimal. Research is frequently pursued to create a separation from external

		influences, rather than to achieve fame on platforms like YouTube.
Foundation	Intuition, experience, and analogy serve as guiding principles in decision-making, often referred to as the "rule of thumb." That is entirely adequate, and there is no inconsistency in that statement. That is fundamentally the situation. A heuristic approach maintains internal consistency. It is entirely reasonable to depend on heuristic facts (as we shall refer to them). The symbol may represent the famous detective Sherlock Holmes.	The logical framework established within the context of the paradigm and the system of theoretical assertions. The foundation is grounded in empirical (scientific) facts. They are actively seeking information about a specific fact from past. The criteria for empirical facts are extensively validated. All mentioned factors—intuition, experience, analogy, and rules of thumb—are significant; however, actions are ultimately grounded in rational standards. Sherlock Holmes would have needed to author articles and books, rather than solely functioning as a private detective.
Part and Whole	Cognitive activity is linked to a specific segment. It can exist independently and have no connection to other elements. The fragment is self-sufficient and complete. An in-depth analysis of a fragment may not result in modifications to the system. These are all "atomic facts." No conclusions can be drawn from them, nor can any subsequent outcomes arise.	Cognitive activity is frequently linked to fragments. However, it consistently suggests the existence of a system and the fragment's alignment with that system. A fragment is not self-sufficient. The fragment and the system exhibit a close relationship. The introduction of a thoroughly examined element that challenges the existing framework has the potential to transform the system itself. It represents a subtle challenge to an established theory, which may ultimately result in its replacement.
Level of validation	Partially verified or not verified at all. A problem exists, along with its corresponding solution. It may take the shape of a clever arrangement of words and	Validated, substantiated through observations or experiments. The verification process is understood to be relative in nature. We acknowledge the contextual

	punctuation. The plausibility of a given arrangement of words and punctuation is the primary standard for validation. The primary criterion is publication. The emphasis on the audience is clear.	nature of the scientific knowledge acquired. The assertion may hold some validity regarding the extinction and survival of certain biological species, yet it may not be evident in others. For instance, there is a mention of fatal pasteurellosis, which poses a lethal threat to *S. t. Tatarica, S. tatarica mongolica, and Loxodonta africana*. Other species do not respond to it. What is the reason for this? The vulnerability of these species has been established through scientific research, though it remains largely unrecognized by the public.
The need for further development	There is no necessity for that. A plausible explanation exists, and it is entirely adequate. An illustration may be found in the context of insect survival. This explanation serves as the final cognitive conclusion. Subsequently, the specialist transitions to a new assignment – a puzzle.	Further development is necessary. In a precise sense, every theory has its inaccuracies. This represents the central argument of fallibilism. However, one cannot participate in scientific knowledge without the foundation of theory. Upon the completion and acceptance of a theory, the process of refinement commences. The originator of the theory plays a role in its own refutation. The essence of Popper's criterion lies in its fundamental purpose. This is not the ultimate cognitive conclusion. In principle, similar to software, there ought to be versions, and version numbers should change regularly.
Form	Approach, strategy, presumption, guiding principle. An intricate implicit relationship may exist between them. It is not necessary to engage in explicit thinking or adhere to the standards of scientific reasoning. You	A collection of regulations, guidelines, equations, and models. It is evident that their complete expression is confined within the boundaries of a specific paradigm. There must be a clear and explicit connection

	seek a solution to a puzzle, and nothing beyond that. Following its discovery, the cognitive process may operate at the level of a "black box". It is unnecessary to waste time thinking about this matter.	among all actions taken. The appropriate context for the application of the formula or model is established each time. Contemplation on the cognitive process is essential. It represents a form of "shadow" within the realm of scientific activity.
Function	A comprehensive guideline for conducting research ("how to search"). It is essential for us to attain a stage where the challenging question is addressed.	A comprehensive explanation regarding the reasoning behind this situation. Clarification of the current situation. It will inherently remain incomplete; however, the key aspect is that it provides a systematic explanation. This enables us to advance our understanding significantly. Completeness is defined as the incorporation of a specific fragment into a broader framework of knowledge.

Table 3. Comparative analysis of heuristic and scientific theoretical approaches.

The pressing question is: to what degree do the heuristic and theoretical approaches engage with one another? Heuristics serve as a cognitive tool, whereas a theory represents the outcome of cognitive processes. Heuristics are more aligned with exploration, hypothesis generation, intuition, and systematic approaches. A theory represents a well-established and validated framework that can be further refined or substituted, yet it possesses essential explanatory capabilities. Heuristics inform the development of theory, and theory itself originated from heuristics.

What is their mode of interaction? What circumstances allow a heuristic approach to transition into a theoretical framework?

I believe that without an explicit justification for the research on the K–Pg boundary ecological catastrophe, it will remain at a heuristic level rather than advancing to consistent scientific reflection. It is possible to discover numerous additional skeletons, teeth, and various other artifacts. These findings hold significance and intrigue; however, they do not inherently advance the shift from heuristics to theoretical reflection. This transition is independent of the accumulation of paleo artifacts. The quantity of likes a YouTube post garner is irrelevant.

The preservation of information about the past and the "survivor bias" in explaining mass extinctions

To acquire a comprehensive understanding of the cognitive framework regarding the study of the mass extinction at the K–Pg boundary, it is essential to have an acute

awareness of the following aspects: The limitations of data and the presence of a specific "survivorship bias" are influential factors. Data bias (sampling bias, taphonomy bias, survivorship bias), represents a key challenge. No existing approach fully addresses it (Foote [1994], Foote et al [1996], Foote [1997], Peters et al [2001], Kidwell et al [2002], Marshall et al [2017], Alroy et al [2008], Raup [1972], Smith et al [2007], Peters [2005]).

The precise amount of information that was lost remains unclear. Our analysis is limited to the available remnants, which inherently constitutes a non-random sample. It is certainly not a matter of chance. It possesses certain inherent limitations that can be fundamental and at times challenging to articulate. Defining these limitations in forming this sample is a significant undertaking. The current level is characterized more by a heuristic approach than by a strictly scientific theoretical framework.

We are working with well-preserved organisms that exhibit solid body structures. Furthermore, they were required to exist and perish within sedimentary basins. Furthermore, we are exclusively addressing what has been officially registered. A number of species at the K–Pg boundary may remain unrecorded. Extinct species that have left no trace on the border are, in any case, not included in the discussion. The full extent of the lost information remains unknown. This gap in knowledge must be considered.

In summary, a specific set of conditions produces an unusual collection of data concerning events at the K-Pg boundary. In any scientific analysis of the current era, it is crucial to recognize that we are confronted with a significantly distorted body of information.

What is the potential for resolving this issue? The concern is of utmost significance. It is essential to gather insights regarding the missing information. The data regarding the 75-25% proportion has been published on numerous occasions. This proportion aligns seamlessly with the observation presented. Should we not consider the lost array of information? Scientific literature addresses this "minor nuance" with precision. At the level of prevailing and purportedly "scientifically validated" knowledge, "minor nuance" is entirely disoriented.

Is it possible to execute this accurately? It is advisable to consider pursuing that option. Currently, biodiversity encompasses a wide array of biological species. A comprehensive exploration of the environmental catastrophe at the K-Pg boundary should also address the question of which aspects of contemporary biodiversity may be preserved as fossils in the future. What can offer insights in various forms, and what will vanish completely.

The "Alvarez meteorite" has made its landing once more. As expected, he reverted to his previous habits. There have been some changes over the past 66 million years; however, these can be considered negligible. Which contemporary biological species, encompassing billions of Homo sapiens individuals, possess the capability to leave information through fossilized remains?

How is the information gap considered in the calculation of the 75/25% ratio?

The process of fossilization is highly selective. Primarily, organisms possessing hard structures such as shells, bones, and exoskeletons are preserved. The preservation of most small, soft-bodied, continental, tropical forms is limited. The likelihood of burial and subsequent discovery differs across various environments and time, even among the surviving groups. The "Late Cretaceous fauna" represents a significantly curated selection of the actual biodiversity present during that period. How representative is this heavily filtered sample? (Sepkoski [1984], Benton [1995], Bambach [2006], Alroy et al [2008], Erwin [2008], May et al [1995], Mora et al [2011]).

The extent of information loss cannot be quantified. It is estimated that approximately 90–95% of all organisms do not fossilize, and among those that do, only a limited number have been discovered. The paleontological record is inherently incomplete and non-random. Consequently, the figure of "75% of extinct species" represents a percentage derived from observed taxa rather than encompassing the entirety of the ancient biota. That is:

- Complete representation of all biotas at the K-Pg boundary;
- Exclusion of 90-95% of organisms that do not fossilize; It can be stated that, from the remaining 10-5%, 5% have been identified and scientifically documented. I find that estimate to be significantly exaggerated, but I will accept it as is;
- Conclusion – if we consider that at the K-Pg boundary, from every million biological species, we are addressing 1,000,000 - 950,000 = 50,000.
- 5% is detailed, amounting to 2500. Based on my understanding, the specified proportion is 75-25% for this matter. However, the figure in question accounts for 0.25% of the original million biological species.

This primarily pertains to marine species. Estimating the percentage of terrestrial biological species that have been accurately described presents critical challenges. It can be stated that the figure is 25%. Within the framework of the infectious hypothesis at the K–Pg boundary, which is primarily associated with terrestrial species, there are only 625 registered and described species out of every million biological species. The value is 0.0625%.

If I perform a highly detailed and precise scientific study of this information, what level of accuracy can I expect in my conclusions for a sample size of 1,000,000? A preliminary option for addressing the question regarding the validity of this type of research can be proposed as follows. This methodology aligns with fundamental principles. Improvements are assured. This serves as a demonstration of logical reasoning.

Methodology for Correcting Extinction Estimates
in an Incomplete and Fossilization-Biased Record

***First*. Conceptual background.**

When only fossilized species are available, the sample represents the subset of organisms that passed the **preservation and discovery filters**, not the total biota.

Quantitative inference is valid **within the fossilizable subset**, but correction is required to approximate the true extinction fraction of all species.

We define three main probabilities:

- p_f — probability of fossilization (an organism leaves a fossil);
- p_d — probability of discovery (a fossil is found and identified);
- q_{obs} — observed extinction fraction among recorded fossils.

The observed dataset size:

$$N_{\text{obs}} = N_{\text{total}} \times p_f \times p_d.$$

***Second*. Estimating the true extinction fraction.**

Observed proportions (q_{obs}) underestimate true extinction (q_{true}) because many taxa never fossilized.

A simple first-order correction:

$$q_{\text{true}} \approx \frac{q_{\text{obs}}}{p_f},$$

Bounded by 1.0 (no fraction can exceed 100 %). If $p_f = 0.1$ and $q_{\text{obs}} = 0.75$, then $q_{\text{true}} \approx 1.0 \rightarrow$ near-total extinction possible.

***Third*. Capture–recapture (*Foote [1994, 1996]*).**

When several stratigraphic intervals are available, the **Petersen mark–recapture estimator** gives a data-driven fossilization probability:

$$\widehat{p_f} = \frac{m}{n_1 + n_2 - m},$$

Where: n_1 = taxa in interval 1, n_2 = taxa in interval 2, m = taxa shared by both intervals.

This allows estimation of the proportion of "invisible survivors" between layers and correction of observed extinction magnitudes.

***Fourth*. Bayesian formulation (optional)**

If direct sampling frequencies are unavailable, assign prior distributions to p_f and p_d (e.g. Beta (α, β) with means based on empirical preservation potentials: 0.3–0.5 for shelled marine taxa, 0.05–0.1 for vertebrates, 0.001–0.01 for soft-bodied taxa).

Posterior inference:

$$P(q_{\text{true}} \mid q_{\text{obs}}) \propto P(q_{\text{obs}} \mid q_{\text{true}}, p_f, p_d)\, P(p_f)\, P(p_d).$$

The resulting credible interval for q_{true} incorporates preservation uncertainty.

***Fifth*. Sensitivity analysis procedure**

1. **Set observed values:** $N_{\text{obs}} = 2500$, $q_{\text{obs}} = 0.75$.

2. **Choose plausible ranges** of p_f and p_d:

marine shelly taxa ≈ 0.3–0.5; terrestrial vertebrates ≈ 0.05–0.1; discovery ≈ 0.5–0.8.

3. **Compute:**

$$N_{\text{total, est}} = \frac{N_{\text{obs}}}{p_f p_d}, q_{\text{true}} = \min\left(\frac{q_{\text{obs}}}{p_f}, 1\right).$$

4. **Tabulate results:**

p_f	p_d	q_{obs}	q_{true}
0.5	0.8	0.75	0.94
0.1	0.8	0.75	1.00
0.05	0.8	0.75	1.00

Interpretation: if only 5–10 % of taxa are fossilized, the observed 75 % extinction among fossils is statistically consistent with near-total extinction of the living biota.

***Sixth*. Reporting language**

“Observed extinction among fossilized taxa (q_obs = 0.75) likely underestimates total biospheric losses, because fossilization and discovery probabilities (p_f, p_d < 1) filter most species out of the record.

Sensitivity analysis with plausible preservation rates (0.05–0.5) yields adjusted extinction fractions between 0.9 and 1.0, consistent with an almost complete biotic collapse at the K–Pg boundary.”

Recommendations for methodology that can be applied when investigating matters associated with the infectious hypothesis of occurrences at the K-Pg boundary. A variety of works were utilized as a foundation. Certainly, a comprehensive explanation of this methodology is available. This series of articles will provide a discussion on the methodology.

The approach of distinctly delineating significant and insignificant information sets for the K–Pg Hyper-virulence hypothesis serves as an illustration of the appropriate formulation of a scientific hypothesis. It clearly delineates the body of knowledge related to the infectious ecotone paradigm. The importance of this lies in the fact that the theory and methodology of a hypothesis pertain to a broader framework of knowledge. The research subject is distinctly articulated. This does not serve as a comprehensive explanation for all aspects of the world. This pertains to the fauna inhabiting the surface at the K–Pg boundary. The processes of extinction and survival of marine fauna cannot be adequately explained by this hypothesis at present. The original paradigm of infectious ecology remains largely underdeveloped, even in the present context. Aquatic organisms are recognized as potential primary contributors to pandemic processes; however, the pandemic itself is a resultant phenomenon primarily associated with terrestrial living organisms. An illustration might be an explanation of COVID-19. This example holds key importance from an epistemological standpoint.

We are transitioning from heuristics to a more rigorous scientific approach in explaining the ecological catastrophe at the K–Pg boundary.

Is the competition of micro-paradigms the foundation for scientific explanation ecological catastrophe at the K-Pg boundary?

In my view, T. Kuhn's concept is particularly relevant for analyzing the case study of the ecological catastrophe at the K-Pg boundary. However, it requires substantial enhancement. The introduction of the concept of "super-normal science" is necessary. Substantial developments have taken place since Thomas Kuhn authored the book. It is essential to provide a comprehensive description of the paradigms associated with small scientific communities as well. Innovative ideas such as "the implicit bunker of normal science" and numerous others are essential. The purpose of the additions is to highlight that the scientific community may engage in actions deemed "incorrect/irrational" not due to a lack of knowledge on how to proceed. This occurs due to its convenience and, frankly, its profitability. There are assurances regarding the maintenance of the current situation and financial stability. The inquiry is examined thoroughly through the lens of geographical science.

A well-defined paradigm that has reached the phase of established scientific inquiry has its advocates. They function as a form of oversight committee. Should an individual exceed the boundaries of their established framework, they will be subject to correction. Should a marginal expert persist in their theses, they will find themselves excluded from the supporters of the prevailing paradigm. His name is likely to remain controversial for an extended period.

The analysis of facts and theories within each paradigm can vary significantly. A paradigm can be compared to an island. Any regulations can be implemented regarding it. All assertions hold true within the confines of this island and under the prevailing paradigm. Inhabitants of a different island – paradigms – may serve as adversaries. They may exhibit a degree of indifference. The Islanders appear to prioritize their own perspective exclusively. The paradigm provides support and adds significance to their activities. The paradigm supporters assert that they are participating in a process of scientific inquiry. The scientific community resembles an archipelago rather than a single continent. In many scientific communities, distinct areas exist, each governed by its own set of regulations.

The investigation of the ecological catastrophe at the K–Pg boundary presents a notably different scenario. There are several micro-paradigms present in this context. There exists intense rivalry among them. The lengthy debate between proponents of the Alvarez hypothesis and advocates of volcanism as the primary cause of the mass extinction during this period is a clear illustration of this point. I believe these do not represent two distinct paradigms. There are a greater number of them. A relevant number of micro-paradigms exist. The features of these paradigms can differ markedly, even within a single foundational perspective (such as an asteroid and its impact or volcanism).

It is my understanding that when a specialist operates within their micro-paradigm, they possess a substantial number of implicit assumptions. He may not address these points, whether intentionally or unintentionally. It extends beyond merely lacking an understanding of epistemology or the principles of scientific reasoning. The problem lies in the deliberate evasion of this information. It presents a challenging situation for a specialist.

The research community focused on mass extinction at the K–Pg boundary is relatively small and specialized. This process operates in a markedly different manner compared to scientific fields, where a multitude of experts is involved. The following represent the paradigms of a small scientific community. In this context, the contribution of the expert who initiates the micro-paradigm can be remarkably important.

These are not merely my opinions. The expressions were made some time ago. I may refer to the work of Professor Sergei Meyen. He was a highly regarded authority in the field of paleobotany (Meyen [1987], [1988], [1989], [1992], [2010], [2009]). He conducted a thorough examination of the specifics of scientific reflection and the daily activities of a small scientific community dedicated to the distant past of planet Earth. A considerable portion of the discussions that took place in Moscow and at the Geological Institute of the USSR Academy of Sciences during the 1970s and 1980s has been lost to history. There are two primary reasons. The initial point pertains to Soviet censorship. The second pertains to the untimely passing of Professor Sergei Meyen. During that period, it was not typical to offer an in-depth analysis of the scientific community through the lens of the Science of Science. A significant amount remained merely discussion.

Nonetheless, the operation of a small scientific community focused on the study of the distant past inherently leads to a scenario where there are eight distinct perspectives for every ten professors. Additionally, they may lack complete stability.

The influence of hype is also considerable. This could represent the primary distinction from other domains of scientific endeavor. If the topic is highly engaging to the public and can secure substantial funding, it is possible that various forms of intentional diversity are influencing the situation. The project is beginning to adopt a somewhat journalistic quality. Your presence deserves to be highlighted prominently. The subject is of no consequence. The multitude of sensations is intricately connected to fossil discoveries. This environment greatly influences the dynamics of cognitive processes. It transitions from a cognitive process to resembling a form of placebo. Concentrating on inappropriate display of enthusiasm regarding their professional duties, financial gain, and elevated ratings for your publications can lead to recognition, profitability, and superior ratings. It might not be related to the cognitive processes of the scientist. Professor Sergei Meyen represented a contrasting case. In his situation, scientific activity served primarily as a means of escape from the realities of Soviet life rather than a pursuit of financial gain, high ratings, or fame, which were not the objectives at that time. The outcome consisted of scientific findings of exceptional significance.

Photos 1-2. Professor Sergei V. Meyen (December 17, 1935 – March 30, 1987)

Discussion

The author welcomes critical analysis and is prepared to address any inquiries. The journal "Pollution and Diseases" is ready to quickly publish articles on this subject matter. The journal's policy demonstrates a high level of acceptance for scientific innovations. It is unwise to expect the author of a scientific innovation to address all challenges independently. The subsequent inquiries may serve as topics for discussion:

- What is the reasoning for not regarding the selectivity of the mass extinction at the K–Pg boundary as a key element in understanding this specific case of ecological disaster? Selectivity exhibits a uniquely distinct character. What accounts for the lack of substantial attention from experts regarding this unusual phenomenon?

- What is the reason for the absence of a reconsidered inquiry concerning the relationship between the asteroid impact and its environmental repercussions? A massive asteroid has undoubtedly impacted the Earth. To what degree is this connected to the mass extinction? What might be the specific cause of this extinction? There are evidently some points that are lacking here.

- What are the reasons that an infectious agent is not regarded as a major factor in the mass extinction of biological species at the K-Pg boundary? Are there not several instances that demonstrate the crucial impact of infectious diseases on specific biological species?

- What explanations can be provided for the specific lists of living and dead organisms at the K–Pg boundary? They exhibit a remarkable lack of logic. What factors may have contributed to the creation of this particular list of surviving and extinct biological species at the K–Pg boundary?

- What methods can be employed to accurately evaluate the level of development concerning the study of the K–Pg boundary environmental catastrophe? To what extent does contemporary scientific methodology enable accurate evaluations of the progress in these subjects? What assistance can it be in enhancing the circumstances surrounding the development of this topic?

- It is evident that research into the topic of mass extinction at the K–Pg boundary is being pursued with a notable emphasis on sensationalism. This is primarily associated with the Alvarez hypothesis. What are the reasons behind this occurrence, and in what ways does such an attitude towards essential scientific subjects influence the outcomes achieved?

Conclusions

1. A concise overview of the K-Pg Hyper-virulence hypothesis is presented. There exists a notable contradiction in that statement. The hypothesis must be presented in a systematic manner. Nevertheless, the structure of a single article restricts the incorporation of numerous critically important information. The organized presentation of the hypothesis, featuring an in-depth discussion of methodological and theoretical considerations, along with the execution of experimental and field work, spans more than 200 pages. A series of articles and subsequent publications will offer increasing detail regarding the impact of the infectious factor on the mass extinction of living organisms at the K-Pg boundary.

2. The K–Pg Hyper-virulence Hypothesis elucidates the mass extinction at the K–Pg boundary as a result of a pandemic process marked by exceptionally high virulence in the pathogenic characteristics of microorganisms, representing a major change in scientific understanding. To date, research has examined an infectious factor associated with the events at the K–Pg boundary; however, these studies have primarily focused on the aftermath of the mass death of various species caused by the asteroid. This infectious process warrants examination; however, it is not the primary focus.

3. The war in Ukraine has notably impeded the organized advancement and discourse surrounding the K–Pg hyper-virulence hypothesis. The results were acquired in the second half of 2021. Shortly thereafter, disorder ensued. The recent challenge also entailed working in conjunction with the hypothesis author. The research topics underwent considerable changes. It was modified to fulfill the demands of wartime circumstances. In 2025, the previous theme will be reinstated.

4. The K–Pg Hyper-virulence Hypothesis was formulated based on the cognitive standard of infectious ecology, establishing a new paradigm. A new fundamental understanding of the pathogenicity of microorganisms, the phenomenon of infection, and infectious diseases has been introduced. The initial publications regarding this paradigm were released in 2010.

5. The examination of mass extinction at the K–Pg boundary serves as one application of this paradigm. This reflects a keen interest not only in the subject of mass extinction but also in the advancement of the infectious ecology paradigm. It is

essential to delineate the scope of its effective application. An examination of an ecological disaster from the distant past serves as a pertinent illustration of this application.

6. The key to the investigation of the ecological catastrophe at the K–Pg boundary, viewed through the lens of the infectious ecology paradigm as an emerging framework, is a distinctly articulated abduction as a cognitive approach. We do not view abduction as an ineffective method. This is one of the methods that is essential for a specific category of knowledge objects. A specific abduction method has been developed for the study of the mass extinction event at the K–Pg boundary. This case is quite atypical. There is a substantial amount of information regarding it associated with various fragments. The issue is rooted in their accurate theoretical comprehension.

7. Abduction is not the sole approach that can be employed to advance the K–Pg Hyper-virulence hypothesis. The foundational concepts of pathogenicity and infection, meticulously formulated within the realm of infectious ecology, trace their origins to the 1970s and subsequent years. Their connection pertains to research carried out at the "Microbe" Institute in Saratov, USSR. There is considerable expertise in conducting systematic field research. This information is also utilized to formulate this hypothesis.

8. A crucial element of field research concerning the emergence of infectious diseases in natural settings is a comprehensive understanding of the phenomenology of the process, which includes a) the formation of a pathogenic ecotone, b) the potential emergence of an infectious disease, c) the variability in virulence expression, and d) the intricate geography of the manifestation of a fatal infectious disease. Acquiring this knowledge requires more than just studying fossils or analyzing statistics related to the consequences of an infectious disease. This represents an entirely distinct area of research. It is being thoroughly examined within the field of infectious ecology as an emerging paradigm.

9. The cognitive potential of the infectious ecology paradigm, along with the associated K–Pg Hyper-virulence hypothesis, facilitates the active implementation of experimental work. An opportunity exists for the experimental validation of a theoretical hypothesis. This can be accomplished through research focused on platinum group elements and by modelling scenarios in which they impact microbial ecosystems under conditions comparable to those that may have prevailed during an asteroid impact.

10. It is widely stated that the ratio of living to dead organisms at the K-Pg boundary is approximately 75% to 25%. This proportion has been established for decades. The extent to which it accurately reflects the ecological situation on the planet as a whole remains uncertain. It can be asserted that "some perished – some endured." A substantial number of species persisted. The specific percentage, whether it is 25% or another figure, is not of immediate concern. The primary consideration is that the substantial number of surviving species necessitates a specific scientific explanation. Up to this point, his explanation has relied on heuristics. It cannot be categorized as scientific. It fails to align with the principles of scientific reasoning.

11. The investigation into the list of organisms, both extant and extinct, at the K–Pg boundary presents a multitude of inquiries. According to the original formulation of the Alvarez hypothesis, along with its various iterations and advancements, comprehending this list is not feasible. One might consider it an issue of minimal significance that does not require attention. However, that would be entirely inaccurate. The inquiry is essential, and if the Alvarez hypothesis fails to provide an explanation, it possesses critical shortcomings. The K–Pg Hyper-virulence hypothesis seeks to elucidate the specific ratio of living to dead organisms at the K–Pg boundary. This approach facilitates the addressing of numerous inquiries while honoring the extensive knowledge surrounding fossil discoveries from this era.

12. The precise 75-25% ratio is not critical for the K–Pg Hyper-virulence hypothesis. The data presented raises critical concerns. However questionable they may be, the primary basis of these findings is research focused on marine fauna. The K–Pg Hyper-virulence hypothesis primarily seeks to elucidate the dynamics of extinction and survival among surface-dwelling faunas. The initial version of this hypothesis does not address the issue of marine species extinction.

13. Employing AI to examine the phenomenon of mass extinctions of biological species is remarkably efficacious. Currently, AI allows us to acquire information to many previously unanswered questions. The role of AI encompasses multiple dimensions. It functions as a significant resource in promoting scientific endeavors. An opportunity exists to reduce time expenses. Furthermore, AI enables an impartial assessment of complex issues. Artificial intelligence is involved in cognitive processing. A genuine expert discourse is emerging. AI conveys a considerable amount of implicit information that a person would generally not express, exhibiting tranquilly and assurance. The contributions of this colleague have to be acknowledged and affirmed in every facet of study.

14. It can be conclusively asserted that there exists a specific opportunity for innovative fundamental perspectives in the examination of the mass extinction event at the K–Pg boundary. The situation cannot be adequately described solely by the occurrence of an unusually large asteroid falling. This decline initiated specific processes that may have contributed to the mass extinction of biological species; however, it alone does not serve as the foundation for such a scenario. A sequence of events likely occurred as a result. The K–Pg Hyper-virulence hypothesis enhances the Alvarez hypothesis and paves the way for a thorough exploration of a particular factor contributing to the extinction of biological species.

Conflict of Interest

The authors declare no conflict of interest.

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