**UNDERSTANDING WILLIAMS OCKHAM’S CONCEPT OF PARSIMONY: A CRITICAL OVERVIEW.**

1. **Introduction:**

William of Ockham (c. 1287-1347) was a prominent philosopher during the High Middle Ages. Born in Ockham, England, he was a theologian, philosopher, and Franciscan friar. Ockham is best known for his metaphysical nominalism and his commitment to simplicity in his philosophical views. He challenged the accepted ideas of his time, like those of Aristotle and Aquinas, advocating for a more parsimonious approach to understanding the world.[[1]](#footnote-1) Ockham’s main contribution to philosophy is his principle of parsimony, which states that “plurality should not be posited without necessity”. The principle gives precedence to simplicity: of two competing theories, the simpler explanation should be preferred.

This written inquiry has as its major preoccupation, the exploration and critical analysis and understanding of William Ockham’s conception of the principle of parsimony (Ockham’s razor), with an inclusion of the origin, definition, its application, kinds of simplicity, justification for the principle, what it entails, and the limitations and criticisms of the principle of parsimony.

* 1. **Origin of Ockham’s Principle of Parsimony (Ockham’s Razor):**

The principle of parsimony is historically attributed to William of Ockham **(c. 1287–1347)**, a 14th-century English philosopher and theologian. He is best known for popularizing the principle through his philosophical and theological work, which became known as Ockham's Razor. However, the idea of parsimony in reasoning predates Ockham and has roots in the works of earlier thinkers. The implication of this is that the principle of parsimony was in existence before Ockham formalized the principle of parsimony. Therefore, William of Ockham is widely known and regarded as the propounder of the principle of parsimony (Ockham’s Razor). This principle can also be called Ockham’s razor is Ockham’s unique application of the principle of parsimony.

‘The term “Ockham’s Razor” was first coined by Scottish metaphysician Sir William Hamilton in 1852 (source). The Latin phrase novacula Occami, or “Ockham’s Razor,” represents the principle’s simplicity, as a razor used to remove unnecessary elements from an explanation (source).’[[2]](#footnote-2) However, having argued that the principle of parsimony, the object of the next inquiry is on the viability and evolution of the principle of parsimony through the history of philosophy.

* 1. **Evolution of the principle of parsimony in the history of philosophy:**

Taking from the above novelty, it is permissible to assert that from investigations and philosophical inquiries, the principle of parsimony, often referred to as Ockham’s razor, along with most medieval doctrines finds its root in Aristotle. For Aristotle, simplicity may be a part of the overall scheme. “Elsewhere Aristotle, when discussing principles of motion states " it is better to assume a smaller and finite number of principles, as Empedocles does," and "a finite number, such as the principles of Empedocles is better than an infinite multitude”.[[3]](#footnote-3) However, there are traces of those who have used this principle in one way or the other, before the use and popularization of the principle by the famous William of Ockham, who is credited as the rightful propounder of Ockham’s razor as seen in his work. They include:

1. Aristotle (384–322 BCE):

In his teleological view of the world and Metaphysics, Aristotle emphasized the importance of simplicity in explanations. He argued that nature operates in the simplest ways possible, a precursor to the principle of parsimony.

1. Ptolemy (c. 100–170 CE):

In his work Almagest, Ptolemy emphasized the need for simplicity in astronomical models, stating that theories should not be unnecessarily complicated. He made an effort in his geocentric model other than relying on undefined and supernatural phenomena of the Universe shows his inner desire for simplicity.

1. John Duns Scotus (1266–1308):

Scotus, a major influence on Ockham, explored ideas related to parsimony in metaphysics and theology. He articulated that unnecessary entities should not be posited without justification, foreshadowing Ockham’s formalization.

1. St. Thomas Aquinas:

In this context have it that “that which has been explained satisfactorily needs no further explanation. " But Aquinas follows this immediately with "we see then that nature does not do by means of two instruments that which can be done by one." This further explanation or motivation of the principle in terms of the simplicity of nature renders Aquinas' principle a metaphysical principle[[4]](#footnote-4)

These were, therefore, major precursors to William of Ockham, who later, in his philosophical writings, made good use of the principle of parsimony and popularized it in a formal way, which is why it was named after him as Ockham’s Razor.

**2.0 Ockham’s Principle of Parsimony (Ockham’s razor):**

Ockham's razor has long been a topic of philosophical discussion. It is a topic that philosophy students have tended to acquaint themselves with early in their educational careers. In that encounter it might have been referred to as Ockham's razor, the nominalists' razor, the principle of simplicity, the law of parsimony, or “*novaculum nominaliurn*,” titles which refer to the dictum “*entia non sunt multiplicanda praeter necessitatem*.” which reads as “Entities must not be multiplied without necessity”. However, apart from this parsimonious maxim, the two main formulations of the principle of parsimony that Ockham held are as follows: “*frustra fit per plura quod potest fieri per pauciora,*” and “*non est ponenda pluralitas sine necessitate*.” These translated would read “in vain we do by many that which can be done by means of fewer,” and “pluralities ought not be supposed without necessity.”[[5]](#footnote-5) Occam’s Razor, also known as the principle of parsimony or the law of parsimony, is a problem-solving principle attributed to the 14th-century English philosopher, William of Ockham. It states that when trying to solve a problem, simpler explanations with fewer assumptions are preferred over more complex ones. In other words, it recommends searching for explanations that are constructed with the smallest possible set of elements. Its Latin form, *novacula Occami*, conveys the idea that the principle works like a razor, shaving off unnecessary components from a theory or explanation.

Hence for Ockham, for a proposition to be a scientific proposition, it must be necessary, susceptible to doubt, and capable of being rendered evident through a demonstration, therefore, much entities should be avoided without absolute necessity.

Ockham holds that we ought to proceed simply not because the world is simple, but because it is a good procedure.

**2.1 Core Elements of the Principle of Parsimony**

1. Simplicity in Explanations:

The simplest explanation that accounts for all observed phenomena is preferable.

Simplicity does not mean oversimplification; the explanation must remain adequate.

1. Avoidance of Unnecessary Entities:

The principle warns against introducing new elements or assumptions unless absolutely necessary for explanatory purposes.

On this, William of Ockham in his “Summa” exposed that that the first root of error is to "lean too much on the peculiarities of speech found in philosophy books' and that the second root of error "consists in the tendency to multiply entities according to the multiplicity of terms, so that for every term there is a thing.[[6]](#footnote-6)

**2.2 Types of Simplicity:**

1. **Syntactic simplicity**: Refers to the number and conciseness of a theory’s basic principles it is also known as formal simplicity, it refers to the simplicity of the structure or form of a theory. It involves the economy of symbols, terms, and rules used in a theory. A syntactically simple theory is one that uses fewer symbols and simpler rules to explain phenomena². For example, in mathematics, a formula that uses fewer variables and operations is considered syntactically simpler.

2. **Ontological simplicity (parsimony)**: Measures the number of different kinds of entities that a theory posits. This concerns the simplicity of the entities and processes that a theory posits. A theory is ontologically simple if it assumes fewer types of entities or processes to explain the same phenomena². For instance, a theory in physics that explains various phenomena using fewer fundamental particles is considered ontologically simpler.

**2.2.1 Comparison and Application**

While syntactic simplicity focuses on the formal aspects of a theory, ontological simplicity is concerned with the nature of the entities involved. Both types of simplicity are valuable in theory selection, but they serve different purposes. Syntactic simplicity makes a theory easier to use and understand, while ontological simplicity makes it more parsimonious in terms of the entities it posits.

In practice, scientists and philosophers often seek a balance between these two types of simplicity. A theory that is both syntactically and ontologically simple is highly valued, but achieving this balance can be challenging. For example, in the history of science, the shift from the Ptolemaic geocentric model to the Copernican heliocentric model was driven by the pursuit of greater ontological simplicity, even though the initial mathematical formulations (syntax) were more complex².

**3.0 Applications of the Principle of Parsimony:**

As already stated this principle has gained wide spread grands as it is applicable to all discipline of studies, some of them are:

**1. Philosophy**

1. **Metaphysics**:

Ockham used the principle to reject unnecessary metaphysical constructs, such as "universal forms" in debates over nominalism vs. realism. Example: Instead of postulating the existence of abstract universals, Ockham argued that only particular entities exist, with universals being mental constructs.

1. **Epistemology**:

The principle underlies skepticism about speculative theories that go beyond observable evidence.

1. **Philosophy of Science:**

Karl Popper emphasized falsifiability and simplicity as criteria for scientific theories.

**2. Science**

**a. Physics**:

Isaac Newton’s laws of motion replaced complex, less parsimonious Aristotelian explanations of movement.

Albert Einstein emphasized simplicity in his famous remark: "Everything should be made as simple as possible, but not simpler." Albert Einstein used the principle of parsimony to develop the *theory of relativity*, which proposed that the laws of physics are the same for all observers, regardless of their relative motion; *quantum mechanics,* where the simplest explanation is often the most accurate.[[7]](#footnote-7) For example, the principle of Ockham’s razor was used to develop the Copenhagen interpretation of quantum mechanics, which is one of the leading theories in in physics

1. **Biology**:

Parsimony is a key concept in cladistics, where the simplest phylogenetic tree (with the fewest evolutionary changes) is preferred. In the study of *evolution*, the law of parsimony is often used to determine a species's most likely evolutionary history. This is done by finding the tree of relationships that requires the fewest evolutionary changes, or the simplest explanation.[[8]](#footnote-8)

1. **Astronomy**:

Copernicus's heliocentric model was simpler than the Ptolemaic geocentric system, which relied on complex epicycles.

**3. Theology**

Ockham applied the principle to theological debates, arguing that divine intervention should not be invoked unnecessarily when natural explanations suffice.

He challenged the proliferation of speculative theological doctrines, advocating for a focus on faith and revelation.

**5. 0 Strengths of the Principle of Parsimony:**

1. **Clarity and Efficiency**: Parsimony provides a clear guideline for formulating and evaluating theories, avoiding unnecessary complexity.
2. **Testability**: Simpler hypotheses are easier to test, falsify, and refine, making them more practical in scientific inquiry.
3. **Predictive Power**: Simpler theory often makes more specific and testable predictions. Ockham’s razor can enhance a hypothesis ability to predict future observation and outcomes providing a practical advantage and scientific and analytic endeavors. Enhancing their utility in both theoretical and applied contexts.
4. **Elegance and Comprehensibility**: Parsimonious explanations are more intuitive and accessible, facilitating understanding and communication.
5. **Reduction of errors:** complex explanations or solutions can introduce more opportunities for errors. Simplicity, guided by our Ockham’s razor reduces the likelihood of mistakes and enhancing the reliability of explanation and Solutions.

**4.0 Limitations and Criticisms of the Principle of Parsimony:**

1. **Nature Is Not Always Simple**: Critics argue that the natural world does not necessarily conform to human preferences for simplicity and complex phenomena may require complex explanations.
2. **Oversimplification**: Parsimony risks eliminating valid but complex hypotheses. Example: Early resistance to quantum mechanics stemmed from its perceived departure from classical simplicity.
3. **Subjectivity**: Determining what constitutes "simplicity" can be subjective and context-dependent.
4. **Historical Misapplications**: Parsimony has sometimes been used to dismiss groundbreaking but initially complex theories, such as Darwin’s theory of evolution or Einstein’s theory of relativity.
5. **Risk of Rejecting Valuable Ideas**: relying too heavily on Ockham’s razor might lead to the premature rejection of novel or unconventional ideas that while complex could offer valuable insight to solution.

**5.0 Examples of Parsimony in Modern Science:**

**Heliocentrism vs. Geocentrism:** Ockham’s Razor favored Copernicus’s heliocentric model over Ptolemy’s geocentric system, as the former required fewer assumptions (e.g., no epicycles).

**Evolutionary Biology:** Parsimony minimizes the number of evolutionary changes required to explain observed traits in determining phylogenetic relationships.

**Wave-Particle Duality:** The principle guided early debates in physics, ultimately leading to quantum mechanics, which reconciles wave and particle theories (Quantum Mechanics).

**8.0 JUSTIFICATION OF THE PRINCIPLE OF PARSIMONY**

**(A) Philosophical, metaphysical, or theological justifications:**

Simplicity is often considered a fundamental aspect of reality, reflecting the underlying order and harmony of the universe. For instance, the concept of Occam's Razor, which states that the simplest explanation is usually the best one, is rooted in this philosophical justification. Also "The universe is governed by simple, elegant laws, such as the law of gravity, which reflects the underlying simplicity of reality.[[9]](#footnote-9)

**(B) Naturalistic justifications, based on appeal to scientific practice**

Scientists often prefer simpler theories because they are more testable, falsifiable, and easier to understand. Simplicity is seen as a pragmatic virtue that facilitates scientific progress.[[10]](#footnote-10) The simplicity of Newton's law of universal gravitation made it a more attractive theory than the complex, ad hoc explanations of planetary motion that preceded it.

**(C) Justifications based on results from probability theory and/or statistics**

Simplicity can be justified using probabilistic and statistical arguments. For instance, the Akaike information criterion (AIC) is a statistical measure that favors simpler models because they are less prone to overfitting. The AIC score of a simple linear regression model is lower than that of a complex, non-linear model, indicating that the simpler model is more likely to be true.[[11]](#footnote-11)

**8.0 Conclusion**: William of Ockham’s principle of parsimony remains a foundational concept in logic, philosophy, and science. It serves as a practical heuristic for reasoning, theory-building, and decision-making. While it is not an infallible rule, its emphasis on simplicity encourages clarity, testability, and efficiency in understanding the natural world. Ockham’s Razor continues to shape intellectual inquiry, bridging medieval scholasticism and contemporary scientific methodologies.

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