

Paradox Identification and Paradox Resolution in Scientific Endeavour: Reconciliation of Contradictory Rulesets in the Interests of Better Theorization and Hypothesis-Building

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Abstract:- This paper seeks to meaningfully complement many of our earlier and previously published papers on scientific method and the philosophy of science among which were our papers on the social responsibility of researchers, science activism, the sociological ninety ten rule, the certainty uncertainty principle, cross-cultural research design, output criteria driven scientific hypothesis formulation, horizontal collaboration etc., and is intended to help produce better scientific theories and hypotheses in general and led to scientific endeavour that is of a fundamentally higher order as well. It will, we expect and anticipate, catapult scientific activity to an altogether higher domain and sphere given that a proactive quest for paradoxes is at the heart of our approach, and is also resultantly expected to be an intrinsic part of formal, structured and pre-defined scientific method in future. It therefore forms an essential and an integral part of our globalization of science movement as well, given the fact that multi-cultural and inter-disciplinary approaches to science are likely to throw up more paradoxes as well, and literally up the ante too by leading to scientific activity that is of a fundamentally higher order. We begin this paper by getting down to brass tacks and attempting a basic definition of the widely used term “paradox” and reviewing older literature in this regard in different contexts. We also lay bare the essentials of our approach, and enunciate the postulates and canons that form a part of our paper, so that the entire philosophy driving this paper, i.e., its philosophical foundation, is clearly grasped and understood by those to whom it is intended.

I. INTRODUCTION

“The paradoxes of today are the prejudices of tomorrow, since the most benighted and the most deplorable prejudices have had their moment of novelty when fashion lent them its fragile grace” –

Marcel Proust, French novelist and literary critic

❖ *Definition of a paradox*

➤ *What is a paradox?*

The term paradox is said to have originated from the Greek words para which means "contrary to" (sometimes interpreted as "beyond") and doxa, which means "opinion" or "thought". This word was subsequently transmitted and transmuted to Latin as "paradoxum" from where it was diffused to modern European languages including English. The term today is widely used in various fields of science and quotidian activity, including diverse fields such as arts, commerce, logic, economics and literature. In the English language, the word paradox is also referred to as a figure of speech. A paradox may therefore be defined as a logically self-contradictory statement (that contradicts itself in essential or in fundamental ways, and in many cases is logically untenable, insupportable or objectionable) or a statement that runs contrary to observation, assessments or to truth statements and truth propositions. A paradox may commonly involve contradictory yet interrelated and interconnected elements and components that co-exist simultaneously (often unharmoniously and uneasily i.e. sharing an uneasy existence) within a larger system or subsystem with a relationship that persists over time. (Such relationships may however evolve and change with the passage of time, with elements moving closer to each other, or away from one another).

Paradoxes may at times also lead to totally absurd or untenable propositions or situations, and may produce incongruities, oddities or anomalies, but at other times possess an element and a nugget of truth. Paradoxes may also often result in what may be called "persistent or continuing contradictions between interdependent elements" leading to what is called a lasting "unity of opposites". In the field of logic, many paradoxes exist which can result in, or form a part of, invalid arguments; these are nevertheless highly valuable in promoting critical thought, and a thorough and a critical re-examination or a reassessment of thoughts and ideas in certain cases may stem or germinate from such paradoxes. There have been several major and important paradoxes that have been observed throughout human history. Some notable examples include Russell's paradox, Curry's paradox, the Barber

paradox, The ship of Theseus paradox, the Grandfather paradox or the time-traveller paradox, the liar paradox, Hilbert's paradox, Newcomb's paradox, etc. The Dutch graphic artist Maurits Cornelis Escher is also said to have deliberately and intentionally used paradoxes in his paintings and drawings; this would in a way, represent one of the philosophical inspirations and foundations of our work; we doubly emphasize the words "deliberately" and "intentionally" with respect to the conscious and structured study of paradoxes. Paradoxes may persist or manifest themselves throughout the lifecycle of meaningful scientific activity; these could even stem from the data used in analysis, the processes or procedures used in scientific investigation, or to the conclusions reached. The term paradox could even be used to refer to living beings or to inanimate objects which contain intrinsic inconsistencies or non-conformities.^{1 2}

There are several distinguishing characteristics of a paradox, and these include, among other things, (a) self-reference: This is said to occur when a formula, sentence or an idea references itself. Self-reference is not an essential condition for a paradox to manifest itself, though it can sometimes lead to it. (b) Vicious circularity or infinite regress which is a form of circular reasoning or a logical fallacy in a never-ending loop. Paradoxes, more often than not, are associated with half-true statements, half-false statements or what we may call variable truths. Assessing, analyzing and identifying paradoxes may also require some verbal or linguistic ability in a leading language like English or in some other language. From our perspective, paradoxes must consciously identified; again, from our perspective, resolving paradoxes will naturally take us to a much higher level of truth and understanding. This is also what we refer to from our perspective, as people-centric science or the democratization of science; scientific method must be mundane and practical enough so that the layman can contribute meaningfully to scientific activity. It is also concurrent with our long-established common-sense principle; if anything cannot be established in a manner that allows for eminent common sense, or requires to be established using superfluous, redundant or bombastic jargon, such a construct must be in very serious

doubt. The idea of a paradox is also related to the term oxymoron which is a figure of speech in the English language which refers to a situation where elements having a totally contradictory meaning are present in the same word, phrase or sentence. Indeed, another term "paradoxymoron" has also been invented, though in a different context.^{3 4 5 6}

➤ Types of paradoxes

In 1962, the American philosopher and logician Willard Van Orman Quine proposed three different classes of paradoxes. According to him, paradoxes could be classified into veridical paradoxes, falsidical paradoxes, and antimonies. A veridical paradox is one which produces a result that appears prima facie absurd, but is demonstrated to be nonetheless quite true. A falsidical paradox on the other hand, establishes a result that not only appears to be false but actually is, and is demonstrably false. A paradox which falls into neither of these two classes is an antimony; the last class is associated with a self-contradictory result achieved through bona fide methods and means of reasoning. A paradox that is both true and false at the same time and in precisely and exactly the same sense is referred to as a dialetheia. This phenomenon is also referred to as true contradictions or a non-dualism. A paradox can also be temporal or primarily observed through the dimension of time, and examples of such paradoxes include bootstrap paradoxes and consistency paradoxes. Other scholars and researchers like the British philosopher and mathematician Frank Ramsey and the Italian mathematician Giuseppe Peano classified paradoxes into logical paradoxes and semantic paradoxes; the former is exemplified by more famous paradoxes like the chicken and egg paradox, while the latter is exemplified by a dependance on semantic notions.^{7 8 9 10}

The idea of paradoxes would, in our opinion, draw some inspiration from the twin concepts of yin and yang which are two complementary principles of Chinese philosophy, where Yin is said to be negative, dark, and feminine, while Yang is said to be positive, bright, and masculine. The interaction between the two opposing forces maintains the harmony of the universe and the harmony of every object within it. We may also extend our basic philosopher to cover or encompass

¹ Frode Alfson Bjørdal, *Librationist Closures of the Paradoxes*, Logic and Logical Philosophy, Vol. 21 No. 4 (2012)

² Mark Sainsbury, 1988, *Paradoxes*, Cambridge: Cambridge University Press

³ Nolt, John Eric; Rohatyn, Dennis; Varzi, Achille (1998). *Schaum's outline of theory and problems of logic*. McGraw-Hill Professional. ISBN 9780070466494.

⁴ Feinberg, Joel; Shafer-Landau, Russ (2008). *Reason and responsibility: readings in some basic problems of philosophy*. Cengage Learning. ISBN 9780495094920.

⁵ Patrick Hughes, 2011, *Paradoxymoron: Foolish Wisdom in Words and Pictures*, Reverspective

⁶ Roy Sorensen, 2005, *A Brief History of the Paradox: Philosophy and the Labyrinths of the Mind*, Oxford University Press

⁷ Gillies, Douglas A., 1982. *Frege, Dedekind, and Peano on the foundations of arithmetic*. Assen, Netherlands: Van Gorcum.

⁸ Murray Murphey, *The Development of Quine's Philosophy* (Heidelberg, Springer, 2012) (Boston Studies in the Philosophy of Science, 291).

⁹ Gibson, Roger F. (1988). *Enlightened Empiricism: An Examination of W. V. Quine's Theory of Knowledge*. Tampa: University of South Florida.

¹⁰ Putnam, Hilary. "The Greatest Logical Positivist". Reprinted in *Realism with a Human Face*, ed. James Conant. Cambridge, MA: Harvard University Press, 1990.

rulesets. But just what is a ruleset? A ruleset is a pre-defined list of rules that applies to a doctrine, establishment or a philosophy. Rulesets must be logical and consistent across all streams, branches, and extensions (or interactions with other disciplines) of the doctrine or philosophy; they must also be well-orchestrated and dependable, and reliable. Rulesets which are not consistent or contradictory with one another, or do not satisfy the principle of internal consistency are said to be contradictory rule sets.

➤ *Statements and postulates*

The following are the statements and postulates of our theory of paradoxes which should sum up the essence and philosophy of our approach:

- The efficacy or effectiveness of a theory is naturally inversely proportional to its level and depth of internal inconsistencies.
- The efficacy of a theory is inversely proportional to its external inconsistencies, on inconsistencies with regard to other related or allied disciplines and fields of study, or other postulates and axioms within the same field of study.
- The term external inconsistency in this context may therefore refer to inconsistencies within the same discipline (across papers and sub-domains, however) or across disciplines.
- The efficacy of a theory is also inversely proportional to its internal inconsistencies, and inconsistencies with regard to other aspects of the theory or proposal itself.
- All aspects of a postulate, theory or hypothesis must also be vetted and ratified constantly against well-established laws and principles.
- Resolving paradoxes must be done actively and proactively; this must become a conscious, consistent and a continuous exercise, carried out both by the author or scholar in question, or by other experts and scholars.
- Resolving paradoxes must be done for cultural perceptions and cross-cultural observations; thus, a dialectical approach must be followed here.
- Validation may be done by internal or external parties and observers. However, they must possess the necessary expertise in this regard and connection.
- The tenets and principles of cross-cultural design must also be taken into account and consideration, and paradoxes must be identified by interdisciplinary and cross-cultural teams, with varied and varying expertise, knowledge and know-how.
- Resolving paradoxes moves the efficacy of the theory automatically to a higher level, and renders it better able to solve problems in the real-world.
- Resolving paradoxes may require changes to external paradigms, and in such cases red flags must be raised, and meaningful collaboration initiated with external third parties. Anomalies must then be corrected to their logical fruition.

- The term paradox is a much more emphatic term than mere internal or external consistency or validity, and must be preferred at all times for a comprehensive analysis. This approach is naturally and intrinsically more comprehensive, composite and holistic than other approaches driving perfection in science.
- This approach also leads us to fundamentally better science when combined with other approaches discussed in our previous papers.
- Theories and hypotheses must also be evaluated, rated and ranked either in isolation or in relation to each other on the basis of this approach.
- Thus, the efficacy of a theory of hypothesis would depend not only on the number of paradoxes, but also on the severity of each paradox, and how central it is to the hypothesis in question. (Thus, the formula is number of paradoxes multiplied by severity of each paradox. This provides us with the overall quantum of internal or external inconsistencies).

➤ *The five fundamental canons of our approach*

The following are the five fundamental canons of our approach, and these we believe constitute the cornerstone and the foundation of all meaningful progress and success in science.

- The efficacy of a theory of hypothesis is indirectly proportional to the number of paradoxes.
- The efficacy of a theory of hypothesis is also indirectly proportional to the number of internal paradoxes.
- The efficacy of a theory of hypothesis is also indirectly proportional to the number of external paradoxes.
- The efficacy of a theory or a hypothesis is also indirectly proportional to the magnitude of the paradoxes.
- Proactively assessing and fixing paradoxes increases the efficacy of the theory or hypothesis in general.

➤ *Dialectical approach*

The dialectical method which has its origins in Greek philosophical techniques, is commonly taken to mean a method of dialogue, debate and discussion that revolves around coming up with answers through the medium of the logical and judicious discourse of arguments and exchange of ideas; thus, there is a conscious exchange of ideas and seamless flow of information between different entities about their point of view. In order for this approach to be successful, all known ideologies must meaningfully be eschewed, (and subjectivity jettisoned for objectivity; we have also discussed and debated myriad definitions of the term ideology in our previous papers), and all parties must be well-aware of the facts or the case, or the facts of the matter. Thus, all parties involved must be interested in, and committed to a quest for the truth, otherwise, the entire exercise will be one in futility; the entire philosophy of the dialectic method must be cascaded and transferred to the approach proposed in this paper as well. It must, needless to say, be followed in intent, letter and spirit. Extending on the work carried out by the Ancient Greeks, the German

philosopher Georg Wilhelm Friedrich Hegel extended the idea of a dialectical approach in modern and meaningful directions. His entire philosophical approach revolved around the idea of a thesis and an antithesis, an argument and a counterargument. Karl Marx (and perhaps rather unfortunately so) proposed a rather limited version of a dialectical approach, and one that dealt with the material world alone, and one that could solely be interpreted in economic terms.^{11 12}

➤ *Reflective equilibrium*

Another important concept and a principle that we would like to draw our readers' attention to is that of reflective equilibrium. The idea of reflective equilibrium is reflected by a general and a natural state of balance, coherence or harmony among a diverse set of beliefs which is arrived at through a process of deliberative mutual adjustment among general principles and judgements. Many great thinkers and philosophers have contributed to the theory and philosophy of reflective equilibrium. Notable among these are John Rawls, Nelson Goodman and Dietmar Hubner. This approach would lead to a sense of justice, and provide a moral compass as well.^{13 14}

➤ *Other techniques*

Other techniques such as slice and dice techniques and dimensional analysis can be suitably and gainfully employed to determine, derive or analyze paradoxes. A slice and dice technique breaks down a body of information into smaller parts and examines it from different viewpoints to understand it better; variations among these parts are then analyzed. Dimensional analysis is used more commonly in the physical sciences and less commonly in the social sciences. It is used to study the attributes of an entity or parts of an entity in relation to a whole, and their relationship to one another. Innovative thinking techniques such as TRIZ, Six hats techniques, Brainstorming techniques, mind mapping and metaphorical thinking may also be gainfully employed here, and we look forward to more research in these areas of study in the days and years to come. Another useful technique is Eliyahu S. Goldratt's widely acclaimed theory of constraints which can help identify lag areas very well, as can also Vilfredo Pareto's Eighty twenty principle which can provide us suitable anchors, and can help determine areas of focus. Most of our earlier papers on scientific methods can serve as useful benchmarks too, and we strongly recommend a readership of all these

papers, so that tools and techniques can be judiciously combined and recombined in multiple ways wherever necessary. All kinds of analyses must be carried out and executed on a purely logical basis, and not on the basis of a counter-ideology, a surfeit or an overdose of emotion.^{15 16 17}

➤ *How to categorize paradoxes*

Paradoxes may be categorized and ranked or scaled based on the following factors:

- Based on how fundamentally some aspects of the theory, hypothesis or paradigm are in conflict with one another.
- Based on how fundamental these paradoxes are in relation to the entire theory, hypothesis or paradigm.
- Based on how fundamental these paradoxes are in relation to well-established concepts or principles.
- Paradoxes can also therefore be categorized on the basis of their magnitude; in other words, they may be severe, large, moderated, low and irrelevant.

Ranking theories from highly reliable to fundamentally flawed Theories, hypotheses, and paradigms may therefore be categorized and classified into the following categories, based on the prevalence of paradoxes and inherent contradictions (Also refer to the formula presented in an earlier part of the paper):

- Highly reliable and credible
- Somewhat reliable and credible
- Needs significant or substantive rework
- Dubious
- Fundamentally flawed and irreparable

Based on the prevalence of paradoxes as derived from the above formula, theories or hypotheses can also be categorized into the following categories based on the overall quantum of rework required:

- Fundamentally flawed and beyond remediation; no amount of rework can possibly help
- Highly flawed, needs major revisions and rework
- Flawed, and needs some rework
- More or less perfect, but needs minor revisions
- Perfect or nearly perfect, needs no rework

Therefore, the following is the logical decision table that would emanate from these discussions:

philosophy and public policy. Cambridge, UK; New York: Cambridge University Press.

¹⁵ Yalin, M. Selim (1971). "Principles of the Theory of Dimensions". *Theory of Hydraulic Models*. pp. 1–34

¹⁶ *Gibson, Roger F., ed. (2004). The Cambridge companion to Quine. Cambridge University Press. ISBN 0521639492.*

¹⁷ *Gibson, Roger F., ed. (2004). The Cambridge companion to Quine. Cambridge University Press. ISBN 0521639492.*

¹¹ Bernard J.F. Lonergan, *Insight: A Study of Human Understanding*, Collected Works vol. 3, ed. Frederick E. Crowe and Robert M. Doran (Toronto: University of Toronto, 1992)

¹² Hyman, A., & Walsh, J. J. (1983). *Philosophy in the Middle Ages: the Christian, Islamic, and Jewish traditions*. Indianapolis: Hackett Pub. Co.

¹³ Nielsen, Kai (January 1982). "Grounding rights and a method of reflective equilibrium". *Inquiry: An Interdisciplinary Journal of Philosophy*.

¹⁴ Daniels, Norman (1996). *Justice and justification: reflective equilibrium in theory and practice*. Cambridge studies in

- Accept the theory, hypothesis or paradigm as it is
- Revise the theory, hypothesis or paradigm as it can on the whole still prove very useful
- Discard the theory, hypothesis or paradigm

➤ *Extensions of this principle or approach*

There could be several extensions and possible alternative uses of this principle or approach, (Besides building dialectical approaches into scientific method, such that they are formally analyzed into say, a table or a structured and a pre-conceived format, and enhancing the quality and reliability of scientific output) and among these would naturally include:

- This approach could be used to identify the efficacy and reliability of an internal review, peer review, third party review or a specialist's review. This is based on the idea and the notion that reviewers may be biased or reviews may otherwise be carried out inappropriately or inadequately. This approach could also therefore be put to effective use to gauge the reliability or appropriateness of the review.
- This approach can be used for evaluating ideologies, belief systems and doctrines that lie within a scientific piece of work, a theory or a hypothesis. Thus, this approach can be used for identifying ulterior motives and political or quasi-scientific agendas as well. Thus, a reviewer can adopt this technique to enhance the quality and strength of his own review.
- This approach can be used for evaluating ideologies, belief systems and doctrines in general as well; for example, we had provided a thorough critique of Marxist historiography in five different papers published by us between the years 2015 and 2023. Readers are particularly advised to read this paper in conjunction with the paper "Historiography by objectives" published by us in the early part of the year 2015, (wherein we had also discussed dialectical approaches in detail) for a maximum overall impact. We had also discussed the inadequacies and the limitations of Marxist intellectualism in our paper on twenty-first century intellectualism published by us in the year 2023. Needless to say, the underlying tenets of this paper, will carry such critiques and constructive scrutiny to altogether a higher level. It can also therefore be probably shown that Marxist Historiography, is egregious, one-sided, and fundamentally and irreparably flawed, and is not in harmony with high quality science and a scientific temper. It does not also fulfil or satisfy the requirements of twenty-first century scholarship in general.

II. CONCLUSION

This paper was a meaningful extension of many of our previously published papers on scientific method and the philosophy of science among which were our papers on the social responsibility of researchers, science activism, the sociological ninety ten rule, the certainty uncertainty principle, cross-cultural research design, output criteria driven scientific hypothesis formulation, horizontal collaboration etc.; Our avowed aim is to naturally produce better scientific theories and hypotheses in general and led to scientific endeavour that is of a fundamentally higher order too. We expect and anticipate that this approach will catapult scientific activity to an altogether higher league given that a proactive quest for paradoxes has been at the heart of our approach, and is also resultantly expected to be an intrinsic part of formal, structured and pre-defined scientific method in future. It therefore forms an intrinsic part of our globalization of science movement as well, given the fact that multi-cultural and inter-disciplinary approaches to science are likely to throw up more paradoxes as well, and literally up the ante too by leading to scientific activity that is of a fundamentally higher order. Science and society will then benefit immensely, and so will people in different parts of the world.