

# Orchestrating “Irreducible Simplicity” in Science and Science Communication: Positioning “Irreducibles Implicity” as a Vital Guiding Principle for Effective and Bonafide Science

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**Abstract:- This paper, which is perhaps our umpteenth and umptieth on scientific method and scientific methodology, proposes, discusses and lays bare the canon of what we propose to call “irreducible simplicity”. We believe and hypothesize that this approach would encompass, and play a natural, pivotal and a vital role in all aspects and facets of scientific activity from the cradle to the grave such as grounds-up hypothesis conceptualization, hypothesis building, detailed hypothesis specification, hypothesis testing and refinement, and structured and effective science communication to the masses, including people from different cultures and different parts of the world. We also review the various and varied steps in common scientific method and methodology, and also review various canons such as the canon of simplicity, the canon of economy, the canon of parsimony, the canon of efficiency, and the canon of efficacy. We also compare and contrast this concept with the concept of “irreducible complexity”; the latter is widely held to be a pseudo-scientific concept, and does not fall within the parameter and radar of bona fide, beneficial and healthy science. We also explain and discuss why this approach would invariably and inevitably catapult and propel science to a higher trajectory, amplify and magnify science communication to the masses, with ample just rewards for the common man, and for science and scientific activity in general.**

## I. INTRODUCTION

*“Make everything as simple as possible, but not simpler”-Albert Einstein*

*“Simplicity is the final achievement. After one has played a vast quantity of notes and more notes, it is simplicity that emerges as the crowning reward of art.”-Frederic Chopin*

This paper, which is perhaps our umpteenth and umptieth on scientific method and scientific methodology over the years, (indeed, we have had a very long saga of science publications on scientific method and scientific techniques of the past several years, particularly over the past one or two years) proposes, discusses and lays bare the canon (which is another commonly used term for a postulate

or a principle) of what we propose to call “irreducible simplicity”. This means that any principle, approach or technique must be simplified as far as possible, and to the extent practicable; unless otherwise justified, it must be simplified to the extent that it cannot be simplified further. However, it must be comprehensive enough at the same time, and must take into account and consideration, a wide variety and diversity of data, and address all real world scenarios. Thus, the needs and postulates of these two seemingly contradictory principles must be counter-balanced and reconciled with each other at any given point in time. Additionally, all internal and external paradoxes must also be reconciled, contradictory evidence and data reconciled, and inter-disciplinary and dialectical approaches adopted. (An example of an on-inter disciplinary approach is the consideration of archaeological evidence in the hunt for solutions for problems as complex as the Aryan one). Solutions to this problem have been simplistic and fundamentally flawed. Therefore, solutions to the study of the Indus script or the Aryan problem have seldom been epistemologically adequate.

Exemptions to all defined expressed rules must also be analyzed in line with the help of our sociological ninety ten rules or principles. Much more vitally, crucially and importantly, these approaches must be reconciled with all concepts in the social sciences; for example, emic approaches, phenomenological approaches, thought worlds, world views, mind-orientations, cultural orientations and structured apperception techniques for socio-cultural change, and theories of socio-cultural change must be borne in mind, and all these must be reconciled by way of a formal analysis. Scientific concepts must also be tweaked and modulated as far as is necessary and practically possible, in order to achieve a broader understanding among peoples of different cultures. Principles and concepts such as this, and those espoused in our previous papers, we hope will owe little to the past and lend much to the future, and usher in a bold and a brave new world of sorts.

Sometimes, many theories and postulates have too much hot air, and too little substance to them. Scientists, researchers and scholars particularly in many different fields of the social sciences, put on airs, and look down sneeringly, haughtily, condescendingly upon the masses. Many derive great pleasure in pontificating to their followers. Some want

to retain an aura of mystery in all their findings to propagate their power, and to pander to their ego. Most of their works were designed foresoteric western audiences rather than for any genuine societal benefit. Their urges, whims and fantasies may have been culturally inspired and derived as well. Many fields or science need a reboot and are alignment. That is why we are taking the trouble to write. The South African comedian Trevor Noah recently stated that Indian researchers were taking the interest and the trouble to solve India-specific research problems. While this endorsement is welcome, and comes like a breath of fresh air, we still have a very, very long way to go. Cultural differences would of course always abound; for example, (in another dimension and plane), the British believed that they were doing India and Indians a great favour by staying there, while they in fact destroyed the Indian economy. They could have managed their affairs not only in India, but also in other colonies much better, and prolonged their stay; but oddly enough, they did not, they proved to be blunderbusses. The blogger Robert Lindsay naively questioned why India had a caste system while Japan and China did not. The answer is very simple and self-explanatory to anyone who cares to probe and investigate the matter; India is multi-ethnic like South Africa and the USA, while Japan and China are not. The time may now have come to kiss goodbye to all these archaic approaches. Therefore, in the twenty-first century, all leading intellectuals must also become ideology-slayers. Most scholars and researchers also do not realistically connect with the masses; indeed, a time may come where scientific methods and scientific methodologies may need to be derived from real-world data and real-word experience. This may often require a generational change; coaxing and cajoling existing and present-day scholars to change and to admit to the error of their ways would be a fool's errand.

This is akin to scientific and scholarly work being judged on the basis of its output attributes. All these may still be some time away. We also believe and hypothesize that this approach would encompass, and play a natural, pivotal and a vital role in all aspects and facets of scientific activity from the cradle to the grave such as hypothesis conceptualization, hypothes is building, more detailed hypothesis formulation, hypothesis benchmarking and hypothesis testing, and structured and effective science communication to the masses, including people belonging to different cultures in different parts of the world. We also review the various and varied steps in common and widely practiced scientific method and methodology, and also review various canons such as the canon of simplicity, the canon of economy, the canon of parsimony, the canon of efficiency, and the canon of efficacy. We also compare and contrast this concept with the concept of "irreducible complexity";the latter is widely held to be a pseudo-scientific concept, (it was initially proposed by a scholar by the name of Michael J. Behe, who is also a biochemist) associated and allied with the Discovery Institute, a conservative Christian think tank institute, and does not, in the opinion of most scholars, fall within the parameters and normal boundaries of bona fide, socially beneficial, socially productive and healthy science either by fundamental and

foundational design or byintent.<sup>1</sup>

There are too many followers and too few original thinkers in the world at large, and this is an unfortunate trend in modern times. May be this has something to do with the education system; there is too much learning by rote, and too little by way of creative thinking. There are far too many lapdogs, thumping boys and stooges (or the "running dos" as the Chinese may want to put it) of the controlling and dominating few, whose ideas and principles are derive from ideologies or antiquated octrines. Dogmas, pseudo-skepticism and skeptopathy still abound galore. Whenever there are original thinkers, their thought processes are influenced by some ideology or the other, or they do not think comprehensively enough, or from a multi-cultural perspective. One can also review all old theories in Indology and on the Indus script against the backdrop of our observations. Would they now make sense or not? This is in spite of the fact that other fields of science (particularly physical and biological sciences) and technology in general have made amazing and wonderful progress. So, what has gone wrong?<sup>234</sup>

## II. THE CANON OF SIMPLICITY

According to the canon of simplicity, every system, approach, structure and design should be Designed to be as intrinsically, fundamentally, essentially and naturally simple as possible, as complicated approaches are usually bound to yield adverse, detrimental or undesirable side-effects. The latter is also at the heart and at the crux of the canon of simplicity. In other words, every system or principle must be simple and easily understandable intelligible to the people, i.e. to the layman and can be grasped and comprehended without any difficulty. Thus, this approach is as vital to science communication as it is to practitioners of science. It has been variously said and postulated:"The art of art, the glory of expression, and the sunshine of the light of letters, is indeed simplicity." "A vocabulary of truth and simplicity will naturally be of a very great service throughout an individual's life." "In character, in style, in manners, and in all other things elegant, the supreme excellence is simplicity. Our principle resonates and echoes very strongly and truly in all these statements and quotes.<sup>56</sup>

## III. THE CANON OF EFFICIENCY

The term efficient refers to the state or quality of being efficient. It may also refer to an action designed to achieve efficiency and is expressed and put forward both in technical terms and non-technical terms. To put it in more mathematical and statistical terms, it not only involves keeping wastage to a minimum, but also in volves maximizing output while minimizing input. It is also therefore commonly measured as a ratio between input and output quantities. This is extremely important because a large volume of output can also be achieved or accomplished inefficiently and using inefficient and wasteful methods and techniques. The idea of efficiency can be used to cover a wide gamut and array of topics and aspects as far apart as material inputs, time, and energy.<sup>7</sup>

#### IV. THE CANON OF EFFECTIVENESS AND EFFICACY

The term Efficiency is one which is very closely related to the concept of effectiveness. While both are unquestionably tightly inter-related, there are many fundamental differences between the two. For one, efficiency is innately measurable in physical and in mathematical or quantifiable terms, while effectiveness is not. The only successful way to measure effectiveness can be based on the result, and in relation to the achievement of stated goals. Thus, while efficiency is doing things right, effectiveness is doing the right kind of things.

#### V. THE CANON OF ECONOMY AND PARSIMONY

The canon of economy implies very thing in science must be expressed (and of course communicated as economically and parsimoniously as logically, reasonably and conceptually possible) that the overheads to society are kept to the barest minimum and as low as possible. This would include the reduction of negative burdens and overheads arising to society to bad science, or badly communicated science, and the amplification and magnification arising to society from good and well-communicated science. Bad science and poorly communicated science can arise not just from poorly communicated science but can stem from ideologies as well.

#### VI. THE CANON OF ELEGANCE

What is elegance? Elegance may be defined as the art of being graceful and styling in appearance or in the manner of conducting oneself and bearing oneself. However, the word has a slightly different connotation in a scholarly realm. Simply defined and put, it refers to neatness and tidiness in arrangement or assembly. It refers to the art of presenting something pleasingly, charmingly, and in an uncluttered fashion. Thus, even a software, a work of art, or a technological advancement can be said to be simple and elegant if it meets all these characteristics and attributes. Another more modulated definition is plainness and austerity, though it is not necessary that all research must meet, satisfy or fulfill these last two objectives. Elegance is also related to syntactic simplicity, and ontological simplicity as well. The scientist cum polymath John von Neumann considers simplicity to be an important esthetic (or an aesthetic in standard British English) criterion of scientific models.

Today, the concept of “irreducible simplicity” by whatever name called, is more or less followed in many or most scientific activity (with possible notable exceptions), but less commonly so, in science communication. Much more importantly and realistically, the requirements of non-western audiences are not considered during science communication. This is a fundamental flaw we must address. This may stem from a high-headed attitude or to retain regional hegemony in science. It may also stem from the fact that Indians, Chinese and Africans are not yet scientifically aware. All science communication (and indeed even scientific preparation, and mainstream scientific activity must consider various emic perspectives (and take into account and consideration), cultural sensitivities and cultural sensibilities of various unrepresented and underrepresented peoples from across the world.<sup>8910</sup>

#### VII. WHAT IS A SCIENTIFIC METHOD?

There are also many different steps in a scientific method, and we have reiterated and examined these thoroughly and critically many times, even ad nauseum. The first step in a scientific method of course would be to define a real-world and a practical problem that needs to be solved through are search methodology and a cogent research strategy. Thus, a research question must be defined and appropriately set up as a basis for further detailed investigation and examination. The next step would be to define a hypothesis, and collect data which both support and go against a hypothesis. Suitable predictions are also then made after analyzing the data in hand thoroughly, meticulously and systematically. In the last step of the study, meaningful conclusions are drawn, and further downstream studies are initiated if required. Results must as far as possible be practically useful, and must solve real-world problems as well.<sup>11121314</sup>

<sup>6</sup>Coyne, Jerry A. (2009). *Why Evolution is True*. Oxford; New York: Oxford University Press. ISBN978-0199230846.LCCN2008042122

<sup>1</sup>Unveiling the Sociological Ninety-ten rules for Social Sciences research: Towards better hypothesis formulation in the Social Sciences in the interests of higher quality research and intellectual multi-polarity Sujay Rao Mandavilli Published in IJISRT, February 2023.

<sup>2</sup>Elucidating the Certainty uncertainty principle for the Social Sciences: Guidelines for hypothesis formulation in the Social Sciences for enhanced objectivity and intellectual multi-polarity Sujay Rao Mandavilli IJISRT, March 2023

<sup>3</sup>Towards scientific apperception tests for twenty-first century social sciences research: Formulating ‘Structured apperception techniques for socio-cultural change’ in twenty-first century social sciences research Sujay Rao Mandavilli IJISRT June 2023

<sup>4</sup>Abbey, Tristan (Pro) (May 13, 2005). "Are Darwinists Chickens?". *Opinions. The Stanford Review. Debating the Merits of Intelligent Design*. Vol.34,no.8.Stanford, CA: Stanford University.ISSN0092-0258

<sup>5</sup>Boudry, Maarten; Blancke, Stefaan; Braeckman, Johan (December2010). "Irreducible Incoherence and Intelligent Design: A Look into the Conceptual Tool box of a Pseudoscience"

### VIII. SCIENCE COMMUNICATION

The idea and the concept of science communication (also often variously known as Public communication of Science and Technology or PCST in sort) refer to the methods, methodologies and the practices employed in communicating, collaborating, educating, and raising general awareness among the common public and the common man regarding different aspects of science (and to a much lesser extent, technology) and using this knowledge to achieve and attain social and cultural amelioration and raise society or people to a higher level of awareness and consciousness. The innate and inherent benefits of science communication are manifold and many. Better grounds-up science communication leads to the evaporation and evisceration of nerdist ivory tower approaches and ensures that scientists are well connected and well attuned to the needs of society, and to the needs of other scientists, both within and across scientific fields and disciplines, are aware of its various fundamental problems and its wide-ranging ants, requirements or needs, such that meaningful and beneficial changes in society can be brought about both through cognizant and well-orchestrated efforts. For further clarity on science communication, and the various diverse methods employed the rein, readers are advised to read our paper on the sociology of science. Science communication is yet in its early infancy in India, and most people continue to be driven and dictated by blind faith and by the guiding principles of ancient beliefs and traditions. We had also explored different types of emic and etic approaches in our paper or cross-cultural research design. Examples of different types of emic approaches would include diverse emic, representative emic, non-representative emic etc.<sup>15</sup>

### IX. IRREDUCIBLE COMPLEXITY

The idea of irreducible complexity also known as IC in short, refers to the idea and the notion that virtually all biological systems including animals and plant could not function if even one part were to be removed. Adherents of this hypothesis claim that this is a refutation of Charles Darwin's theory of evolution. They also claim that it is highly unlikely that all parts of a living organism could have evolved together; hence, in their view this is adequate and sufficient evidence for the negation of evolution. Of course, evolution is true, and this represents a mechanism by which smaller and less complex organisms evolved into larger and more complex organisms. While there are many facets of evolution we do not fully understand, the idea of irreducible complexity is tied to Christian creationism, intelligent design, and all other forms of pseudo-science. Many forms of intelligent design and creationism are rigidly bound and tied to Christian theology; the theory of intelligent design also interferes with the doctrine of naturalism. According to this well-established doctrine, all phenomena must be explained with respect to natural laws without taking recourse to the supernatural. Thus, miracles and divine intervention can have no place in the state of things. This, like the concept of specified complexity, is adequate proof of design by an intelligent agent, according to creationists. However, we do

admit that there are a whole lot of issues regarding the origin of life we do not know or fully understand.

The idea of God has never been fully defined, neither has the idea of an intelligent agent. Thus, "Continuous zero-based reassessment of assumptions, hypotheses and methods" must include and naturally encompass a constant grounds-up definition and redefinition of concepts at all times. This is extremely important because proponents and critiques of the definition of God do not satisfactorily and adequately explain what the definition is. Hence, the debate is extremely anomalous to say the least. Therefore, a constant and a continuous examination and re-examination of basic concepts would constitute a fundamental part of the above-mentioned idea of "Continuous zero-based reassessment of assumptions, hypotheses and methods". The definition of core concepts and core issues would therefore be fundamental to any debate, and debate would in fact be totally meaningless without it. As a matter of fact, definition of core concepts should be an essential and a fundamental pre cursor to all meaningful debate. Concepts such as "guided evolution" and "unguided evolution" are untestable, and therefore fall outside the boundaries of legitimate science. Likewise, we talk about the FOXP2 gene. Ascribing everything to a gene appears to be prima facie neat and tidy. But just what exactly does this gene mean? Scientists also talk about "nature" and the "laws of nature". But ascribing everything to the "laws of nature" is a convenient weapon and a line of defence. It is a convenient and euphemistic way of saying we know very little.

Proponents of Intelligent design have included Michael J. Behe, Phillip E. Johnson, Nancy Pearsey, Percival Davis, Den H. Kenyon and others. Extreme forms of creationism include forms such as young earth creationism; such theorists advocate that the earth is only a few thousand years old at best. A more moderate version of creationism is theistic evolution or evolution that is guided by an unseen force or entity. While this is indeed both plausible and possible, how can it be tested? Hypotheses that define God as a cosmic force or energy maybe more plausible though. At the other and opposite end of the spectrum, dogmatic atheism may also be non-science.

<sup>7</sup>Edwards, P., Ed. (1967). *The Encyclopedia of Philosophy*. New York, The Macmillan Company

<sup>8</sup>Richmond, Samuel A. (1996) "A Simplification of the Theory of Simplicity", *Synthese* 107:373–393.

<sup>9</sup>Charles Dudley Warner, Editor, *Library Of The World's Best Literature Ancient And Modern, Vol. II*, 1896. Online at Project Gutenberg

<sup>10</sup>Fundamentals of research methodology and statistics Copyright©2006 New Age International (P)Ltd., Publishers, Yogesh Kumar Singh.

<sup>11</sup>Donald L. Harnett and James L. Murphy, *Introductory Statistical Analysis, Research methodology, Methods and techniques*, CRK othari, copyright©2004, 1990, 1985, New Age International(P)Ltd., Publishers

Per the concept of irreducible simplicity, all theories and scientific concepts and laws, must be articulated in a manner that makes sense to the common man across diverse cultures and concepts, and help him override his pre-scientific beliefs. This would include concepts as far apart as Albert Einstein's theory of relativity and quantum mechanics. This would go a long way in empowering the scientifically unprivileged and under privileged. Thus, it is not only technology that can empower humans; science also definitely can. As the late great Indian thinker and the towering Indian intellectual Dr BR Ambedkar pointed out, most Indians were (and to still a large extent are) gullible and fall prey to Mahatmas (now holy men or Godmen). These great men perpetuate blind faith in the place of intelligence and reason. People cannot stand up and think and reason for themselves. Science has yet to penetrate the human psyche, but the democratization of science undoubtedly and unquestionably will help us in this cause. We must also at the same time, loathe and condemn all forms of "isms".<sup>161718</sup>

With Marxist historians, everything lies outside the realm of objectivity and progress, and in the realm of subjectivity. They are scientifically untrained and are mostly guided by perceptions of identity. We make a reference to the sinking ship of Marxism; their job is done in the economic sphere, and almost and very nearly done in the intellectual sphere. As an old age ends, and a new one begins, Marxist historiography must be consigned to history; their voices and weapons must fall silent, and new interdisciplinary approaches forged that take what is good in Marxist approaches to history.

People in India and elsewhere don't possess a scientific temper, and are not yet ready for it. They look at science with utmost suspicion. Hence, we must not only create new formidable weapons to enhance the armoury and arsenal of science, but we must also communicate them appropriately to the masses through various media and for a, and last but not the least, through better education which in our definition would mean carefully thought through and structured education systems. Thus, and therefore, everything must be brought out from the realm of subjectivity, and into the realm of objectivity; every statement and assertion should have epistemological validity; this idea steadily remains at the heart of our philosophy of continuous zero-based assessment too. No longer can a Dr Gregory Possehl be entitled to his opinions, unless he states them as reasonable assumptions, or states them as his mere conjectures (his own reasonably and practically constructed hypotheses) or his personal opinions on the matter. Even if this can't be immediately implemented, we can attempt it for starters. Exceptions to this rule or principle must of course only be justified on a case-to-case basis.<sup>2021</sup>

## X. CONCLUSION

This paper, which has perhaps been our umpteenth and umptieth on scientific method and scientific methodology, had proposed, discussed and laid bare the canon of what we propose to call "irreducible simplicity". We believe and hypothesize that this approach would encompass, and play a natural, pivotal and a vital role in all aspects and facets of scientific activity from the cradle to the grave such as grounds-up hypothesis conceptualization, hypothesis building, detailed hypothesis specification, hypothesis testing and refinement, and structured and effective science communication to the masses, including people from different cultures and different parts of the world. We had also reviewed the various and varied steps in common scientific method and methodology, and had also reviewed various canons such as the canon of simplicity, the canon of economy, the canon of parsimony, the canon of efficiency, and the canon of efficacy. We had also compared and contrasted this concept with the concept of "irreducible complexity"; the latter is widely held to be a pseudo-scientific concept, and does not fall within the parameter of bonafide, beneficial and healthy science. We had also explained and discussed why this approach could invariably and inevitably catapult and propel science to a higher trajectory, amplify and magnify science communication to the masses, with ample just rewards for the common man, and for science and scientific activity in general. Other scholars and intellectuals must now take forward these concepts and ideals to a higher level and bring them to fruition.

<sup>12</sup>Unleashing the potential of the 'Sociology of Science': Capitalizing on the power of science to usher in social, cultural and intellectual revolutions across the world, and lay the foundations of twenty-first century pedagogy Sujay Rao Mandavilli Elk Asia Pacific Journal of Social Science, October– December 2020

<sup>13</sup>Simon, Stephanie (May 2, 2008). "Evolution's Critics Shift Tactics With Schools". *The Wall Street Journal*.

<sup>14</sup>O'Rourke, J. J. (6 December 2012). *The Problem of Freedom in Marxist Thought*. Springer Science & Business Media. p.5. ISBN 9789401021203.

<sup>15</sup>Marx, Karl (1993)[1858]. *Grundrisse: Foundations of the Critique of Political Economy*. Translated by Nicolaus, M. Penguin Classics. p.265. ISBN 0-14-044575-7