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Devising Smoking Gun Tests for Objectivity in Scholarship: Towards a Comprehensive Set of Indicators to Measure Objectivity in Scholarship

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Abstract: The core objective of this paper is to develop guidelines for developing criteria also known as smoking gun tests for ascertaining and measuring objectivity, accuracy, precision, and rigour in scholarship. We naturally begin this paper by attempting to define what research and scientific method are, and then correlate them with other concepts in this paper such as objectivity, objectivity in mindset, certainty, precision, exactitude, and limits to objectivity. We also then vet and ratify our concepts with the concepts proposed in our earlier papers on scientific method over the years, and other general scientific concepts and methods too. The twin concepts of discourse analysis and content analysis are also reviewed in detail, and we propose a four stage model and approach in this paper, namely the execution of discourse analysis and content analysis, the identification and categorization of fallacies including new ones as a part of a continuous process of identification and categorization, and the creation of objective criteria and smoking gun tests to align with these fallacies. Some examples are provided in support of the above method, though tests can only be continuously developed and added upon as a part of an elaborate and a protracted and continuous process. We hope, expect, and anticipate that this will become an important part and parcel of twenty-first century scientific method, with rich rewards in store for myriad facets of scientific activity.

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I. INTRODUCTION

After all, the ultimate goal of all research is not objectivity, but truth - Helene Deutsch

Dispassionate objectivity is itself a passion, for the real and for the truth - Abraham Maslow

Accuracy is the twin brother of honesty; inaccuracy is a near kin to falsehood - Tryon Edwards

The power of accurate observation is commonly called cynicism by those who have not got it – George Bernard Shaw

The core and the avowed objective of this paper is to develop guidelines for developing criteria which are also known as smoking gun tests for ascertaining and measuring objectivity, accuracy, precision, and rigour in relation to scientific scholarship. We naturally begin this paper by attempting to define what research and scientific method are, and subsequently correlate them with other concepts in this paper such as objectivity, objectivity in mindset, certainty, precision, exactitude, and limits to objectivity. We also then vet and ratify our concepts with many of the concepts proposed in several of our earlier papers on scientific method over the years, and other general and widely-circulated scientific concepts and methods too. The twin concepts of discourse analysis and content analysis are also reviewed in detail, and we propose a four stage model and approach in this paper, namely the execution of a formal discourse analysis and content analysis, the identification and categorization of fallacies including new ones as a part of a continuous process of identification and categorization, and the creation of objective criteria and smoking gun tests to align with these fallacies, thereby compensating for them or rendering them invalid as the case may be. As an intrinsic part of this approach and technique, limits and barriers to objectivity in scholarship are also analyzed. We believe this to be an indubitable method because all methods can arguably be compartmentalized into fallacies. Some random examples are provided in support of the above method, though tests can only be continuously developed and added upon as a part of an elaborate and a protracted and continuous process that may span several years. We therefore hope, expect, and anticipate that this will become an important part and parcel of twenty-first century scientific method, with rich rewards in store for myriad facets of scientific endeavour and activity, as this can not only be used in various disciplines of the social sciences such as historiography, sociology and anthropology, but in most other fields of the natural and physical sciences too, to

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equally good effect. Therefore, our contention is that scientific method must not only be taught in schools and colleges to students from an early date, it must also be brought upto date, and must change with the times. This will naturally lead us all to scientific progress at the speed of light, and usher in a new scientific age.

➢ *What Is Research?*

Research (a term that stems or originates from a four hundred year old French term "researcher") may be defined, as a highly creative, structured and systematic work or activity that is primarily undertaken by dedicated and committed groups or teams of people known as scientists, researchers, or scholars in order to increase the body of knowledge in a given discipline or a field of study, or across diverse or multiple fields of study, and seek solutions to unknown issues or open-ended questions. According to the eminent American researcher and scholar of scientific method John W. Creswell, "research is a series of sequential steps that is used to collect and analyze information in order to increase understanding of a given (often vexatious) topic or issue". The educational researcher John W. Best defines research as "A systematic and objective analysis and recording of controlled observations that should lead to the development of generalizations, sound and rock solid principles, or bullet proof theories, resulting in prediction and possibly ultimate control of events". Research involves the laying down and execution of several sequential steps such as the collection, organization, and analysis of data or evidence with a view to thoroughly grasp a topic, by rigorously pursuing objectivity, precision and accuracy, and minimizing scope for all forms of biases, prejudices, and errors.

The primary three steps in research may also be said to be posing a question, collecting data to answer the research question, and presenting an answer to the research question. Researchers must also serve the cause of science, society and the education system, and this is something that is largely missing in today's research probably due to the widespread and rampant prevalence of ideologies and counter-ideologies, and the compartmentalization of scholars and researchers into ideological camps. Researchers are being paid for their work, and cannot afford to merely dabble in esoteric pursuits or compromise the quality of research for their own selfish pursuits. Research may also be conveniently classified and categorized into pure and basic research that focuses on discovery and invention, and applied research that focuses on putting science to work in order to solve real-world problems. Research types have been traditionally categorized as exploratory research (used to collect initial thoughts, and develop concepts and hypotheses), descriptive research, (used to describe the characteristics of a phenomenon or population) explanatory research, (used to explain a phenomenon with reference to its root cause) correlational research, (used to correlate different observations by also seeking out the why's) and causal research which is used to identify cause and effect patterns. Further classifications of research as quantitative research, (numerical or statistical based research) qualitative research, (non-numerical or non-statistical based research) or mixed methods research, which makes used of both qualitative and quantitative methods, are also common. [1] [2] [3]

➢ *What Is Scientific Method?*

Simply defined, and crudely explained, a scientific method is nothing but a systematic and a methodological approach to better make sense of the world we live in, and of phenomena in general, by conceptualizing and executing a series of well-defined steps including systematic and empirical observations, rational judgments, inquiry and critical examination (including analysis and dissection) of data and evidence, formulation of hypotheses, making predictions, conducting experiments, and drawing inferences and conclusions. Scientific method is often iterative, and the same steps may be repeated again and again until a satisfactory conclusion is reached. Other approaches such as dialectical approaches and cross-cultural research design may also form a part of scientific method, and in this connection we may also invoke primary methods in scientific research such as inductive approaches and deductive approaches, before referring them to our previous papers where they were explained in a greater level of detail and much more comprehensively. The inductive probabilistic model, another novel and exciting approach, may also be followed, with probabilistic factors assigned to various scenarios. Inferential reasoning techniques and syllogism too may be utilized wherever possible and necessary. Syllogism means drawing conclusions from two or more datasets. This technique too is commonly used in research. [4] [5] [6] [7] [8] [9]

[1] [1] Groh, Arnold (2018). *Research Methods in Indigenous Contexts*. New York: Springer. ISBN 978-3-319-72774-5

[2] [2] Cohen, N.; Arieli, T. (2011). "Field research in conflict environments: Methodological challenges and snowball sampling". *Journal of Peace Research*. **48** (4): 423–436

[3] Talja, Sanna and Pamela J. Mckenzie (2007). Editor's Introduction: Special Issue on Discursive Approaches to Information Seeking in Context, The University of Chicago Press

4 Bauer, Henry H., Scientific Literacy and the Myth of the Scientific Method, University of Illinois Press, Champaign, IL, 1992

5 Crombie, A.C. (1953), Robert Grosseteste and the Origins of Experimental Science 1100–1700, Oxford: Clarendon

[6] 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

[7] 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

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➢ *What Is Objectivity?*

The term objectivity is an extremely important and a core and an intrinsic component in science, and must be thoroughly and carefully grasped and comprehended if any form of meaningful progress is to be accomplished and achieved in scientific endeavour or activity. Simply explained, objectivity may be said to refer to attempts to perform and execute better quality research by doing away with all non-scientific and non-objective approaches whether they may be in the form of personal biases or prejudices, emotions, unfounded perceptions, and opinions, irrational and illogical emotions or patently false beliefs, while emphasizing proven facts and rock solid and irrefutable evidence alone. Objectivity is intrinsically related to the concepts of testability, verifiability, falsifiability, and reproducibility. Testability and verifiability refer to the extent to which a paradigm, framework or a hypothesis are capable of being independently tested and verified. In sum, hypotheses, frameworks, and paradigms should also be capable of being extended and modified if necessary. They must of course, also be falsifiable, and this is an important condition set forth by the famous twentieth century philosopher of science Karl Popper. The distinction between subjectivity and objectivity is a core concept in epistemology, and must therefore not only be adequately but also thoroughly grasped and understood.

We have also spoken all along about objectivity in mindset. But what exactly is objectivity in mindset? Objectivity in mindset refers to a researchers unwavering and dispassionate commitment to objectivity and the pursuit of the truth – objectivity in mindset must be rigorously pursued at all times by force and dint of habit, even if the truth itself proves to be elusive, at least for the time being or the present. Let is now review some more concepts very briefly, and in passing. What exactly is certainty? Certainty refers to the state of being fully confident or having absolutely no doubt with regard to a particular issue, the state and condition of which is referred to as certitude. It is the exact opposite of uncertainty which is characterized by imperfect or unprovable information. An imponderable is something that is incapable of being evaluated, weighed upon, or assessed with exactness and precision because there may be a large number of unknown variables involved. The presence of a large number of imponderables may lead to the underlying paradigm or framework itself being basically or fundamentally flawed. The exact opposite of this concept is indubitability, which is taken to means the quality of being beyond a shadow of reasonable doubt or question. Accuracy and precision are two other very important measures of observational error. Accuracy is a measure of how close a given set of measurements are to their actual value, while precision is a measure of how close the measurements are to each other. The term “trueness” is also used in the language of science as a reflection of what is demonstrably and incontrovertibly true. "Exactitude" is another term that is used to refer to the quality of being highly accurate, exact and precise. All the terms discussed above are different from each other, though they may be fallaciously used loosely and interchangeably. [10] [11] [12] [13]

Let us now discuss one more very important term, namely, verisimilitude. Verisimilitude refers to the quality of the appearance of being true or real. Another term for verisimilitude is truthlikeliness. Among the chief proponents of the concept was Karl Popper, the world-famous twentieth century philosopher of science. Popper’s ideas were however, criticized by the likes of Pavel Tichý, John Henry Harris, and David Miller, and most of this scholar’s ideas are not accepted by modern and contemporary researchers at face value. According to Karl Popper, the history of science is replete with instances of transitions from non-comprehensive theories to better theories, and most scientists do not get it “right” the first time. Therefore, truth nearness is the most viable and the most likely path, and the march towards the absolute truth can only be accomplished progressively. Popper also supported the hypothetico-deductive method as opposed to the inductive method; we are somewhat at odds with him here, as we believe researchers must target the discovery of thee truth from the very start – at least, to the extent possible. This is of course, subject to time and cost constraints, besides the availability of readymade.

Badly written theories pollute the world of scholarship, and cause serious damage to science, and to the reputation of the researcher as well. We can cite the prevalence of obsolete theories in Indology in this context, and these have only served to wind the clock back by several decades. We need inductivism; we need grounded research as far as practically

[8] Operationalizing cross-cultural research design: Practical, cost-effective, and a minimalistic application of cross-cultural research design to minimize cultural bias in research and reconcile diverse viewpoints IJISRT, April 2023 Sujay Rao Mandavilli

[9] Making the use of Inductive approaches, Nomothetic theorybuilding and the application of Grounded theory widespread in the social sciences: A guide to better research and theorization in the social sciences Sujay Rao Mandavilli IJISRT May 2023

[10] Copi, I.M.; Cohen, C.; Flage, D.E. (2006). Essentials of Logic (Second ed.). Upper Saddle River, NJ: Pearson Education

[11] Newton, Issac (1999) [1726 (3rd ed.)]. Philosophiæ Naturalis Principia Mathematica [Mathematical Principles of Natural Philosophy]. The Principia: Mathematical Principles of Natural Philosophy

[12] Research design: Qualitative, quantitative and mixed method approaches, John W. Creswell, Sage publications, fourth edition, 2014

[13] RESEARCH METHODOLOGY: TOOLS AND TECHNIQUES Dr. Prabhat Pandey Dr. Meenu Mishra Pandey © Bridge Center, 2015

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possible. We believe that theories must as far as possible be replaced by scientific models that take into account and consideration, a wide range of observable data. Scientific modeling to put it in a nutshell, is a complex and systematic process which involves creating representations (which are usually physical, mathematical, statistical, or conceptual) of real-world phenomena to help understand, explain, predict, depict, and visualize complex systems or processes. For example, the Out of Africa model is grossly oversimplified because it does not take into account and consideration data from a wide variety of contexts and sources. Good models must possess an enormous degree of explanatory power, and in this context (i.e, of the OAT which itself is too oversimplified and popularity-driven to possess any degree of complex explanatory power) must take into view large tomes of data from all parts of the world, remote regions such as the Andaman and Nicobar islands, Polynesia, and Melanesia included. Imperfectly conceptualized theories also add to the time overload and delay scientific progress immeasurably.

Suppose we want to tie success in life to proficiency either in the mother tongue, English or any other language, technical proficiency in multiple streams, life skills, mind orientation, cultural orientation, ambition, aspiration, besides possibly innumerable other factors, and tie all these in turn to other concepts such as the theory of linguistic expectation, the theory of non-linguistic expectation, linguistic sweet spot, economic sweet spot, etc, we must use different methods such as the case study method, inductive approaches, along with participant observation method and ethnography. Thus, data triangulation, investor triangulation, and method triangulation also need to be used. We also may need to perform aggregation techniques, besides identifying deviations and variations systematically. We also need to define independent, intervening and dependent variables, and tweak and optimize economic development models accordingly. This is not easy work, but must be done nonetheless because the pursuit of science must primarily be in service of society. This principle is not always followed. Scholars such as Popper conveniently ignore the scholar's and researcher's duties towards science, society, and the education system. This is an allegation we will continue to make ad infinitum, unless course corrections are instituted to the entire underlying methodology in science sooner than later. We had authored another paper called "Advocating Output Criteria based Scientific and Research Methodologies: why the Reliability of Scientific and Research Methods Must be Measured based on Output Criteria and Attributes" in August 2023. In this aforesaid paper, we discussed other attributes and characteristics of good research such as validity, reliability, comprehensiveness, systematicity, repeatability, reproducibility, measurability, credibility, coherence, transparency, etc. Readers are kindly referred to go through the aforesaid paper for more information. A fair modicum of objectivity is also essential if developing countries are to progress in science, We have been harping on this all along, and for several years now. [14] [15] [16] [17] [18]

- *Limits To Objectivity*

In the following section of the paper, we discuss the various limits and barriers to objectivity, and as far as possible, also propose some techniques to overcome or surmount them. These are very common and practical barriers and limits to absolute objectivity, and present and manifest themselves to a very high degree in the real world on most occasions. Therefore, we will always argue that smoking gun tests can be devised and presented in relation to these limits, as approaches to overcome them can be devised. This will naturally catapult and escalate the quality and quantum of scientific activity to a much higher degree. There will be no simple and straightforward solutions in most cases – researchers must be prepared to deal with complexity- For example, Richard Sproat's smoking gun test can be easily falsified as we have shown in a previous paper that dealt with the Indus script. Objectivity in mindset and the preparedness to deal with complexity are our two recommendations here.

- *Subjectivity*

Subjectivity as contrasted with objectivity, is refers to the general notion that everyone is entitled to their own cherished and deeply-held perspectives and beliefs, which can be communicated to others and can be influenced by other perspectives multi-directionally and multi-dimensionally in a multicultural milieu, context, or setting. Subjectivity often arises because the brain is either not aware of, or is unable to process a large volume of data dealing with, or pertaining to diverse beliefs, attitudes, and perspectives without imposing its own pre-existing thoughts or ideas. Subjectivity may be viewed either in a positive or a negative light, though it may be consigned to the background as wider perspectives emerge, and become ubiquitous in due course. As such, it may be said

[14] Rao, C.R., Mitra, S.K. and Matthai, A. (1966) : Formulae and Tables for Statistical Work, Statistical Publishing Society, Kolkota – 700108

[15] Sampath, S. (2005) : Sampling Theory & Methods, Second Edition, Narosa Publishing House, New Delhi, Chennai, Mumbai, Kolkata

[16] Singh, Kultar (2007) : Quantitative Social Research Methods, Sage Publications (Pvt.) Limited, New Delhi

[17] Singleton Jr., Royce A. & Straits, Bruce C. (2005) : Approaches to Social Research, 4th Edition, Oxford University Press, New York – Oxford

[18] Advocating output criteria based scientific and research methodologies: Why the reliability of scientific and research methods must be measured based on output criteria and attributes Sujay Rao Mandavilli IJISRT, August 2023

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that subjective and non-objective approaches are a major barrier to scientific progress and advancement. [19]

➢ *Absence of Scientific Temper*

Scientific temper is deeply, fundamentally and foundationally essential to the success of any scientific endeavour or activity. Among the many essential facets of a scientific temper are rationality, open-minded thinking and behaviour, and critical thinking skills, the use of rigorous scientific methods of scientific inquiry such as critical examination and scrutiny, observation, testing, and analysis to make sense of different phenomena. As per this approach, individuals must approach problems and issues based on pure and undiluted logic and reasoning, critical thought, evidence and reason alone, instead of relying on preconceived notions and biases. Open-mindedness and flexibility of thought are also extremely important, along with self-correcting and self-adjusting scholarship. Every claim and belief must therefore be critically revalidated and corroborated with other evidence, and must not be taken or held unquestioningly, or at face value. Scientific temper must be inculcated and cherished as an intrinsic and a foundational way of life – and as structured and systemic ways of thinking and acting that are applied to all facets of scientific activity. [20] [21]

➢ *Researchers' Cultural Bias*

Researchers' cultural biases and prejudices would also for the large part, be dependent on researchers' background which would also include social, religious, linguistic, national and territorial backgrounds. Researchers' backgrounds, and past positive or negative accumulated experiences, can both directly and indirectly influence their interpretations of data and observations, and conclusions reached. This may often take place subtly and subconsciously; Even if researchers strive for objectivity, they may unconsciously incorporate their own values and belief systems into the research process. Therefore, we may have different types of cognitive biases stemming from cultural biases, such as confirmation bias (seeking out information that only confirms or validates existing beliefs), all of which can interfere with objective analysis, and impact with the quality of research.

➢ *Researcher Ideology*

An ideology is a set of beliefs or values by an individual or group of individuals, especially those are held without complete evaluation or critical scrutiny. The term originates from French term l'ideologie, which can be further traced to Greek terms idea meaning idea and logia which means the study of. The term ideology in the modern sense was coined by Antoine Destutt de Tracy, a French Enlightenment thinker, who conceived the term in the year 1796 as the "science of ideas" to oppose non-rational constructs. The term gained further prominence with the ideas and writings of Karl Marx and Friedrich Engels. Though the term initially had a very positive connotation, the meaning of the term moved back and forth between positive and negative connotations several times. It is largely seen in a negative light today. The idea of a "Scientific ideology," as developed by the French philosopher and physician Georges Canguilhem, refers to a concept that is not fully scientific, but pretends to be such. Ideologies of all forms and kinds may lead to researcher biases and prejudices, and ultimately intransigence, ineptitude, obsolescence and irrelevance in due course. [22] [23]

➢ *General Researcher Incompetence*

Researcher incompetence refers to his inability to do something successfully; it generally refers to his ineptitude. This may arise or emanate from his lack of training, lack of professional skill, or lack of general awareness and knowledge. Researchers may often lack domain expertise or subject matter expertise. At other times, they may lack knowledge of scientific method or research methodology. All this will impact research quality and research output adversely significantly by leading to researcher dogma and intransigence as well. Research quantum and quality is bound to nosedive as a result, with catastrophic consequences for science and a scientific temper. [24] [25]

➢ *Vested Interest*

A vested interest is a personal stake an individual has in something, usually its success or its failure: For example, an individual may have a vested interest in registering a property in his or her name, and not letting his spouse or partner gain

[19] Dallmayr, Winfried Reinhard. *Twilight of Subjectivity: Contributions to a Post-Individualist Theory Politics*. Amherst, MA:[University of Massachusetts Press, 1981

[20] Farrell, Frank B. *Subjectivity, Realism, and Postmodernism: The Recovery of the World in Recent Philosophy*. Cambridge – New York: Cambridge University Press, 1994

[21] Lauer, Quentin. *The Triumph of Subjectivity: An Introduction to Transcendental Phenomenology*. Fordham University Press, 1958

[22] Geroulanos, Stefanos, and Todd Meyers, "Georges Canguilhem's Critique of Medical Reason", in Georges Canguilhem, *Writings on Medicine* (Fordham University Press, 2012), 1-24

[23] Gutting, Gary, "Canguilhem's history of science" in *Michel Foucault's Archaeology of Scientific Reason: Science and the History of Reason* (Cambridge University Press, 1989), pp. 32–52

[24] Instituting "Institutional coherentism" as a prerequisite for high-quality science: Another crucial step for winning the battle for consistent high-quality science Sujay Rao Mandavilli IJISRT, February 2024

[25] Baking innovative and creative thinking techniques into scientific method: Towards innovative and creative techniques as an intrinsic part of scientific method for higher scientific and research output Sujay Rao Mandavilli IJISRT January 2024

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control, or likewise, a business may have a vested interest in securing new customers and businesses, and ensuring that market share of its competitors declines. In most such cases, financial gain may be involved, though this may not always necessarily be the case. The term "vested", which was first recorded in 1818, uses vested in the sense of "secured" or established". Vested interests may also take on the form of careerism or career advancements. The term, when used pejoratively, often refers to the unregulated pursuit of one's own career advancement goals, usually at the expense of ethics or integrity, or the overall cause and interests of science. [26]

- *Conflict of Interest*

A conflict of interest results from a situation in which an individual or an organization is involved in multiple interests, financial or non-financial, one or more of which conflict with another, either directly or indirectly, leading to opposing pecuniary interests or loyalties. They may also lead to moral and ethical dilemmas or quandaries. An interest in this context and situation, may refer to a obligation, duty, commitment or goal associated with a specific role, and that is compromised or jeopardized by the performance of another conflicting or opposing role. We must also seek to distinguish between primary interest and secondary interest here. Primary interest may be taken to mean the primary goals of an activity while secondary interest refers to other personal benefits such as a desire to advance oneself technically or professionally. [27]

- *Value Judgment*

A value judgment, also known as a normative judgment, is a judgment that weighs in on the rightness or wrongness of an individual or his actions, based on a thorough evaluation or sound judgment. It also may seek to identify and define "what ought to be" or "what should be". The concept is mostly used positively, though in rare occasions, may also be used negatively. Value judgment is often based on benchmarking against a given or specific value set or value system. Value systems must ideally be positive and beneficial, and must contribute to scientific advancement, though this may not always be the case. In such a case quality and the quantum of scientific activity may be compromised. Max Weber, GH Hardy, and others have also written about value neutrality, and this may refer to a complete and total independence from a value system. However, this must not lead to insularity, and the researcher must be generally aware of all value propositions, and the happenings and goings on in all parts of the world. Researchers must also bear in mind ethical dilemmas at all times. Ethical dilemmas result from situations that require a decision to be made involving a conflict between differing values or principles. Some examples of ethical dilemmas include journalism confidentiality, environmental considerations, contribution to a scientific temper as opposed to personal interests, etc. Researchers must proactively seek to identify ethics involved in a proposition, and identify the harm it may entail to one or more parties, and to society in general. These must be implemented in due course, and all unsavoury aspects associated with decision making eliminated. [28]

- *Research Methodology And Research Design Not Properly Defined*

Research methodology is a method that is used to identify, collect, analyze, and interpret information regarding a topic in a scientific and a structured fashion. Research methodology also clearly defines and delineates the procedures and techniques that are used to conduct research. The various and the different components of research methodology are research design, data collection strategy and techniques, data analysis techniques, etc. Research methodology includes observations about time, cost and budget constraints, sampling strategy, etc. A research design on the other hand, is an overall strategy that outlines how a study will be conducted, detailing the methods that are to be used for data collection, data analysis, and data interpretation in order to address a specific research question. Some researchers may follow an adhoc or an arbitrary approach (i.e. a non-reliable or a non-reproducible, and a loosely structured approach) to research methodology and research design, thereby greatly compromising on the quality of research output. [29] [30]

- *Absence of Complete Information*

Researchers may also be hampered by the absence of complete information, which may constrain the quality and quantity of research output. For example, a researcher may wish to carry out an inductive approach to research design, or follow grounded research methodology, in all such cases, data may not be available, or even if it is, may not be obtainable and verifiable easily. Primary literature review and secondary literature review may also need to be carried out, and again, all the reference material may not be available. This may be all the more true where cost, time, or other budgetary constraints

[26] Towards a formal analysis of "vested interests" as an intrinsic part of social science research techniques: Another crucial component of social and cultural progress Sujay Rao Mandavilli IJISRT, September 2024

[27] Acocella, N. and Di Bartolomeo, G. and Piacquadio, P.G. [2009], Conflict of interest, (implicit) coalitions and Nash policy games, in: Economics Letters, 105: 303–305

28 Fotion, N. (1998). "Military Ethics". In Chadwick, Ruth (ed.). Encyclopedia of Applied Ethics (2 ed.). Academic Press. ISBN 978-0-12-373932-2

29 Silverman, David (Ed). (2011). Qualitative Research: Issues of Theory, Method and Practice, Third Edition. London, Thousand Oaks, New Delhi, Singapore: Sage Publications

30 Patton, M. Q. (2002). Qualitative research & evaluation methods (3rd edition). Thousand Oaks, California: Sage Publications

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are involved, and there is external or internal pressure to deliver a research report, or produce tangible results.

➢ *Complexity of Real-World Issues*

Real world issues are often complex and multifaceted, making it difficult to isolate and measure specific factors objectively, comprehensively, and appropriately. A large number of variables may need to be initialized, including independent, dependant, and intervening variables, and in all such cases, researchers may be out of breadth on how to deal with them or grapple with them. Cultural biases and cultural prejudices may reign supreme, or in most other cases, a total disinterest or nonchalance towards other cultures. We had written about Eurocentrism earlier, but Michael Witzel of Harvard University also talks about Indocentrism as a major threat to science and scholarly objectivity. While all these may be true, evidence must always be presented, along with comprehensive remediation plans and action items,

➢ *Limitations of Hypothetico-Deductive Method*

The hypothetico-deductive method, which is predominantly used in scientific research, (and also advocated by many leading researchers of the day, even if fallaciously) involves formulating an initial hypothesis using some crude or raw data, deducing predictions that can be further tested, and then rigorously testing those predictions through further experimentation or additional observation, with the ultimate goals of either confirming or falsifying the original hypothesis. All steps may be performed or executed iteratively, until a more detailed and comprehensive hypothesis emerges. We have always argued for inductive methods, and grounded research, though these are not sometimes followed in the interests of time or cost budget. In many cases awareness may also be lacking. We believe this fundamental lacuna has the potential to compromise the quality of research, and resultantly delay progress in science as well. [31]

➢ *Qualitative Research Design Followed*

Qualitative research design which is widely and extensively, if not universally used in social science research, focuses chiefly on investigating and analyzing complex (and mostly social) phenomena through the mechanism of rigorous and in-depth data collection techniques such as interviews, observations, surveys, and focus group discussions, with a view to uncover perceptions and subjective experiences. This may also involve ethnography and participant observation methods. Sometimes case study methods, narrative research, and action research are also used. Emic and etic approaches of various types are also involved here, along with dialectical and etmic approaches. Process tracing is also often used as a qualitative method and technique to test theories. This is used to weigh data in favour of, and against a hypothesis, and to classify evidence into strong and weak evidence. Naturally, there is a great scope for non-precision and non-accuracy here, and errors and subjectivity may creep in. [32]

➢ *Interpretivism and Phenomenology*

Interpretivism is an important research technique commonly used in the social sciences. This technique emphasizes understanding the subjective meanings, behavioural patterns and subjective interpretations of individuals and their actions within a specific social and a cultural context, as opposed to seeking out universal laws or non-subjective truths. The key Principles of interpretivism, are subjectivity and social construction, a strong focus on meaning, the use of qualitative research methods, emphasis on context, opposition to positivism, and reliance on post-positivism, etc. Phenomenology, as a philosophical movement, involves the study of structures of experience and consciousness, with an emphasis on investigating lived experiences. Phenomenological research involves analyzing subjective experiences to gain insights into the meanings and significance of phenomena. Naturally, all these forms of researchers involve a great deal of subjectivity, and objectivity may not be the primary concern of most researchers pursuing these kinds of research. Likewise, structuralism seeks to uncover the hidden patterns behind how humans think, feel, and act. This is widely used in sociology, anthropology, psychology and linguistics, and involves a great deal of subjectivity as well. [33] [34]

➢ *Measurement In Research*

In the field of qualitative and quantitative research, the process of measurement typically involves systematically assigning numbers or values to characteristics or attributes of objects, allowing researchers to systematically quantify variables and collect data in a systematized way. This process is crucial and critical for understanding and analyzing phenomena. This approach involves understanding and modeling phenomena, generation of hypothesis, quantifying variables, pursuing data collection, setting up relationship between variables, and testing hypothesis. Errors in measurement can be broadly classified as systematic errors, (instrumental errors, observation errors, and environmental errors), random errors, and gross errors (absolute errors, relative errors, percentage errors, greatest possible error and measurement location errors), each stemming from different sources and impacting measurement accuracy and

[31] *Brody, Thomas A. (1993), The Philosophy Behind Physics, Springer Verlag, ISBN 0-387-55914-0.* (Luis de la Peña and Peter E. Hodgson, eds

[32] Bynum, W.F.; Porter, Roy (2005), *Oxford Dictionary of Scientific Quotations*, Oxford, ISBN 0-19-858409-1

[33] Ashley D, Orenstein DM (2005). *Sociological theory: Classical statements (6th ed.)*. Boston: Pearson Education. p. 241

[34] Weber, Max *The Nature of Social Action* in Runciman, W.G. 'Weber: Selections in Translation' Cambridge University Press, 1991. p. 7

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precision. We also have null hypotheses, and alternative hypothesis, type I and type II errors, (false positive and false negative respectively) etc- all these are widely used in statistical analysis such as ANOVA analysis.

In research, "scaling" refers to the process of assigning numbers or quantitative values to represent the properties or characteristics of objects or observations, thereby transforming qualitative data into quantitative data for further meaningful mathematical analysis. These are also sometimes referred to as quantification techniques, and scales such as Likert's scale, Guttman's scale, and Thurstone's scale are often used. In some cases, ranking scales are used, and products or services are ranked in a continuum from best to worst. In some cases, sampling errors may also occur during the course of a research. These errors stem from the fact that samples are drawn from the population for further analysis, instead of the entire population being used. The appropriate sample size may not be used, or a less than ideal sampling technique may be used in some cases. For example, we may have random sampling, quota sampling, cluster sampling, judgmental sampling etc, and the researcher must know when to use what method by sheer force and dint of experience. [35] [36]

It may be somewhat useful and handy to discuss scientism in brief here. Scientism, which is a form of fallacy, assumes that science is the only valid way to know about the world and that all forms of non-scientific knowledge are invalid. This ideology grew from the writings of Sir Francis Bacon, though this is sometimes disputed. Later proponents of scientism included James Ladyman, David Spurrett, Don Ross, and Alexander Rosenberg. Proponents of scientism assume that everything can be measured quantitatively and put down in black and white, and subscribe to an overblown role to be played by science in society, often discounting the role played by culture and cultural institutions – this belief may however prove to be fallacious, and sometimes borders on dogmatism and naivety. Scientism however, may itself be strong or weak and distinct instances may be roughly placed in a continuum between the two extremes. Scientism can often lead to errors as well, and as always, the appropriate kind of research strategy may be used. [37]

- *What Is A Smoking Gun Test?*

The term "smoking gun" as it is understood in scientific method is a general reference to a conclusive and irrefutable test of a hypothesis or a set of observations. This concept draws metaphorically from the concept of a gunshot with trailing smoke. In the context of hypotheses evaluation, a "smoking gun test" refers to a strong piece of evidence that provides strong and clinching support for a causal explanation and a cause and effect linkage, or a paradigm or framework. A smoking gun test usually rules out or edges out alternative explanations, in all but the rarest of cases. Other types of tests include "straw in the wind tests" and "hoop tests," all of which have different degrees of strength in supporting a hypothesis or a claim. A straw in the wind test provides only weak support for an explanation, neither irrefutably supporting nor disproving it, and thereby leaving room for other alternative explanations. A "hoop test" is a method to assess the strength of evidence by establishing criteria that a hypothesis must meet in order to remain viable, with failing a hoop test automatically disqualifying the hypothesis or theory, and eliminating it from the scheme of things. In the context of hypothesis, a "doubly decisive test" is an extremely strong type of test that both confirms a particular hypothesis and eliminates all other competing explanations in parallel, thereby providing very strong evidence in the process. A litmus test is also a definitively indicative test that is used both in Chemistry, and in the social sciences, much like an acid test. We may also briefly refer to a Turing test here, and one that was named after Alan Turing in the 1950's. The Turing Test is a way to determine if a machine can think like a human. The test is still used today to study artificial intelligence, and has since spawned many derivatives. We will not succumb or subscribe to such gross over-simplifications. Our motto is, and has always been, "Simplify as much as possible, but no more." There are indeed many limitations of Turing test, and there is a need for a composite approach; rock solid empirical models must be built, and readers may refer to our previous essays delineating the importance of modeling in science, and the importance of interdisciplinary and transdisciplinary methods to boot. Also refer to our works on integrationism, foundationalism, and institutional coherentism. [38] [39] [40] [41] [42]

[35] John Scott. *Fifty Key Sociologists: The Contemporary Theorists.* Routledge. 2006. p. 19

[36] Levine, Donald (ed) 'Simmel: On individuality and social forms' Chicago University Press, 1971. p. 6

[37] Bunge, Mario (1983). *Epistemology & Methodology II: Understanding the World*. Treatise on Basic Philosophy. Vol. 6. Dordrecht; Boston

[38] George, Alexander L. 1979. "Case Studies and Theory Development: The Method of Structured, Focused Comparison." In Diplomacy: New Approaches in History, Theory and Policy, ed. Paul Gordon Lauren, 43–68. New York: The Free Press

[39] Rogowski, Ronald. 2010. "How Inference in the Social (but Not the Physical) Sciences Neglects Theoretical Anomaly." In Rethinking Social Inquiry: Diverse Tools, Shared Standards, 2nd ed., ed. Henry E. Brady and David Collier, 89–97. Lanham, MD: Rowman and Littlefield

[40] Orchestrating "Irreducible simplicity" in science and science communication: Positioning "irreducible simplicity" as a vital guiding principle for effective and bona fide science Sujay Rao Mandavilli IJISRT, February 2024

[41] Emphasizing "integrationism" in twenty-first century science: Another useful tool to generate better scientific paradigms better quality science Sujay Rao Mandavilli IJISRT October 2024

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➢ *Discourse Analysis*

Discourse analysis in qualitative research is a strategy that seeks to examine both spoken and written language in different social contexts and situations, focusing on how communication shapes our understanding of the world and social relations, thereby throwing light on power dynamics, linguistic equalities and inequalities, and underlying linguistic and non-linguistic meanings. Key aspects of discourse analysis includes an analysis of language in cultural, social, and historical contexts in which language is used, and a discussion of how language constructs a richness of meaning, shapes perceptions, creates and maintains social identities, and influences social interactions in multiple ways. There are different methods and approaches involved in discourse analysis. For example, descriptive discourse analysis focuses on structural features of language and how they can create rich and complex meanings. Critical Discourse Analysis, on the other hand examines power relationships and social inequalities as expressed and communicated through the medium of language, while interpretive discourse analysis focuses on the subjective meanings and interpretations of language. Data is collected from a wide variety of sources including speeches, transcribed interviews, focus group discussions, textual analysis, etc. [43]

➢ *Narrative Analysis*

Narrative analysis is a similar qualitative research method that seeks to understand and interpret either stories or accounts and narratives of events, lived experiences, or human interactions in order to discover deeper patterns, themes, and meanings. It also critically examines the content, structure, and context of narratives in order to understand how people experience events, feelings, emotions and make decisions accordingly. This approach focuses on narrative stories, interpretation and analysis, understanding lived experiences, dialogic and performance analysis, structural analysis, thematic analysis in order to unearth patterns, understanding cultural manifestations and power dynamics, etc. in this case, both discourse analysis and narrative analysis can be used to identity scientific fallacies, and logical fallacies before attempts can be taken to counter them through the use of suitably devised tests. [44]

➢ *Content Analysis*

Content analysis refers to a semi-standardized set of procedures that are used for collecting and organizing information that in turn allows analysts to make many types of inferences regarding the characteristics, attributes and meaning of written materials which may include both the content and structure of those materials. This technique can be used to research a wide array of problems in the domain of communication and dissemination of information. According to a definition provided by researcher Bernard Berelson, “Content analysis is a research technique that is used in the objective, systematic, and quantitative description of the manifest content of communication along with a scientific analysis of communication messages”. According to the eminent communications researcher William J Paisley, “Content analysis may be defined as a phase of information processing by means of which communication content is transformed through and objective and systematic application of categorization rules and techniques into a data format that can be easily summarized and compared”. The above definitions are self-explanatory, and content analysis is therefore a structured and a systematic technique for analyzing message content and communication behaviour and strategies with many different kinds of benefits to science. Content analysis is not a single technique, instead it encompasses a wide array of approaches used in the analysis of texts or other communicative messages. Examples of these are conceptual content analysis used to identify concepts, and relational content analysis which is used to identify relations between concepts.

➢ *Critical Analysis*

Critical analysis refers to the formal and systematic process of researchers becoming aware of their own perceptual biases by utilizing dialectical or non-dialectical techniques. This technique ensures that researchers formally take into account and consideration their own innate biases and prejudices, and in turn strive to eliminate them as far as practically possible. Critical analysis is very useful for unearthing biases and prejudices so that they can be quantified and eliminated. This can then be further used to derive and devise smoking gun tests that can accordingly be used to improve research output and quality. Critical reasoning is also a very important technique here, and one that must be carefully cultivated. [45]

➢ *Metrics And Measurements Used In Science*

Scientometrics is an extremely vital and important subfield of infometrics that studies many different quantitative aspects of scholarly literature. Major aspects measured in various aspects of research include the measurement of the

[42] Building upon “Foundationalism” to achieve the objectives of contemporary science: How this can lead to faster scientific progress and inclusive science Sujay Rao Mandavilli IJISRT, October 2024

[43] James, Carl (June 1993). "What is applied linguistics?". *International Journal of Applied Linguistics*. **3** (1): 17–32

[44] Wortham, Stanton; Kim, Deoksoon; May, Stephen, eds. (2017). *Discourse and Education*. Cham: Springer International Publishing

[45] Cederblom, J B.; Paulsen, David (2012). *Critical Reasoning: Understanding and Criticizing Arguments and Theories* (7th ed.). Andover, Hampshire, UK: Cengage Learning

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impact of published research articles and academic or scholarly journals, the analysis and scrunity of scientific citations, and the use of such measurements in furthering the general goals of science besides improving the quality of research. Scientometrics overlaps significantly and considerably with many other scientific fields such as information science, information systems, the sociology of science, and metascience. Modern scientometrics is largely derived from the work of prominent researchers Derek J. de Solla Price and Eugene Garfield who are credited with having created the Science Citation Index and founding the "Institute for Scientific Information" as well. Scientometrics is widely used today, though we believe the field can be used to analyze and correct errors in science with a great degree of efficacy. The term latency as it is understood in quotidian life, encompasses many different but overlapping definitions. The term is however, generally used as a synonym for undue delay in various facets of scientific activity, leading to slower scientific progress, or in some cases, no progress at all. The study and measurement of latency period can also be used as a vital input in improving scientific methodology, and rich dividends will naturally yield from such a process. All this useful information can also be used to derive smoking gun tests for objectivity. [46] [47]

➢ *Four Stage Approach*

The following is the four stage approach that we recommend for cataloguing smoking gun tests to determine objectivity of frameworks and paradigms, though this approach is by no means rigid and normative. Researchers may therefore come up with their own additional tests, if or as and when required. When better and more commendable approaches are found, they can naturally be listed and implemented, as we believe that the entire process must not be a static, but a recursive and an iterative one.

- Perform discourse analysis, narrative analysis and content analysis on the basis of the guidelines, approaches and techniques described in this paper or elsewhere. This must however, be carried out in true letter and spirit.
- Identify fallacies in science on the basis of the above criteria in addition to the already existing prelisted fallacies in science that may be obtained from any reliable sources in scientific literature.
- Devise objective criteria and smoking gun tests to align with fallacies, by identifying possible errors associated with each of the fallacies. We have every reason to believe that this will be a foolproof and a reliable approach.
- It will also be possible to identify objective criteria and smoking gun tests directly. This will therefore naturally be a multi-barreled approach that will close all ends of the spectrum in parallel, and leave minimum chance for exclusion. One source is to also identify barriers to objectivity and seek out steps to close or mitigate them – we had detailed this in another section of the paper. This paper therefore, only at best seeks to promote a general approach, and lay out recommendatory guidelines. It is therefore upto a large number of dedicated and committed individual researchers to complete the list. This may be a slow and a long-winding list, and one that may take years, decades, and even aeons, if necessary. However so be it; this approach is also naturally bound to accelerate the rate of scientific progress in the years and decades to come.

➢ *Fallacies In Science*

A fallacy may be defined as a mistaken belief, especially one that is based on unsound, illogical, irrational, or incomplete arguments. A fallacy may also ensue or result from a failure in reasoning which therefore renders the argument in question invalid. These failures may be attributed to intentional errors of commission (i.e. with an intention to deceive other individuals most notably the general scientific community), carelessness, lack of knowledge, competence, or comprehension. Fallacies often slip through unnoticed, and this may impede or delay progress in science. That is why fallacies must be identified comprehensively upfront, and steps must be taken to mitigate them. This is the core underlying philosophy behind the authorship of this paper. The term is first believed to have been introduced in western intellectual tradition by Aristotle in his work "Sophistical Refutations". Fallacies are often sub-divided into "formal fallacies" and "informal fallacies". A formal fallacy is a flaw in a deductive argument that renders the argument itself wholly invalid, while an informal fallacy mostly stems an error in reasoning. Arguments with informal fallacies are often fallacious, though sometimes invalid. There is a standard list of fallacies in science. However, new fallacies may also be identified using discourse analysis, content analysis and narrative analysis besides several of the other techniques that we had proposed. All these methods were also reviewed and discussed briefly in this paper. Smoking gun test must be devised to detect, expose and counter such fallacies, and those who do so, will be doing science a good turn by doing away with such fallacies in the long-run. These must be applied to all facets of scientific activity and endeavour be it hypothesis

[46] Lowry, Paul Benjamin; Humphreys, Sean; Malwitz, Jason; Nix, Joshua C (2007). "A scientometric study of the perceived quality of business and technical communication journals". *IEEE Transactions on Professional Communication*. **50** (4): 352–378

[47] Reducing the 'latency period' for the acceptance of new scientific ideas: Positioning the 'latency period' for the acceptance of scientific ideas as an indicator of scientific maturity Sujay Rao Mandavilli IJISRT January 2024

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generation, publication of research findings, or peer-review. [48] [49] [50] [51] [52]

➢ *List of Fallacies In Science*

We present below a list of some fallacies in science, though this does not purport to be a complete or a final or a comprehensive list. Fallacies may also be often classified into propositional fallacies (errors concerning propositions), quantification fallacies (which occur when quantifiers of premises do not tally with quantifiers of conclusions), syllogistic fallacies (fallacies pertaining to syllogisms), informal fallacies (fallacies that are basically unsound due to the absence of well-grounded premises), and statistical fallacies or fallacies attributed to statistical causes.

➢ *Ad Hominem Fallacy*

The ad hominem fallacy is one of the most often cited fallacies in science. This fallacy involves attacking the person who makes the argument instead addressing the argument itself. For example, summarily dismissing, other otherwise ridiculing and mocking a scientist's findings because of the reviewer's bias or cultural background instead of evaluating the evidence impartially. Ad hominem attacks may involve character assassination, evaluating the individual's racial or ethnic background, his institutional affiliation, or questioning motives, instead of engaging with the other party on the basis of merit alone. The term is thought to be of a Latin origin. Therefore, we must attack the work, not the researcher, review must be based on solid and non-biased evidence, review must be identical regardless of the researcher's cultural background, a list of questions must be developed to detect ad hominem fallacies. Smoking gun tests must also be likewise developed to test failure on this score and aberrations as well. For example, we may devise tests to ensure whether research execution and reviews are one hundred percent unbiased on not, or whether any errors have inadvertently crept in.

An important variation of the above theme is a genetic fallacy which is also known as the fallacy of origins. The genetic fallacy refers to a type of a logical fallacy where an argument or claim is either accepted or refuted solely based on its origin, provenance or history, often the originators cultural origins or association with the paradigm in question (i.e. social, cultural or religious background), rather than its actual merits or evidence.

➢ *Appeal to Authority*

Appeal to authority is another very important fallacy in science. This fallacy occurs when an argument or premise is based solely or entirely on the authority of a specific person or institution, rather than on pure and adulterated logic or evidence. In such a case, another researcher may accept a claim as being true chiefly because another individual holding a position of authority supports it, and not because the underlying evidence or reasoning behind the claim has been systematically verified. Even though citing experts may be extremely important, blindly accepting claims from individuals who consider themselves experts without scrutiny may be highly problematic. Therefore, specific smoking gun tests must be devised to critically evaluate and isolate such fallacies, and this need not necessarily to restricted to only one test as is the case with all the other fallacies described and detailed in this section.

➢ *Straw Man Fallacy*

The straw man fallacy is another very important fallacy in science. This fallacy involves grossly misrepresenting or greatly distorting (in some cases, oversimplifying) an opponent's argument in order to make it for an individual much easier to attack the second party or to condemn and malign him. In some cases, the other party may stand accused of making statements or claims that he did not actually claim. The first party then attacks the misrepresented argument instead of the original version of the argument, or by using other irrelevant arguments. Therefore, this kind of argument involved not only false reasoning, but also character assassination in many cases. Such fallacies are notoriously hard or difficult to detect, but the researcher must stay the course. Smoking gun tests must also be devised in a way that such misrepresentations stand exposed, even if this is by no means an easy or a straight forward task.

➢ *False Dilemma Fallacy*

This fallacy which is also sometimes called or referred to as a false dichotomy fallacy, falsely presents and posits only two options in a debate or argument as if they are the only two viable or feasible possibilities, when in reality, there are many other different possibilities or alternatives. The false dilemma fallacy, is also known as the false dichotomy fallacy or "either/or" fallacy, and (often conveniently or deliberately so) ignores a wide variety of perspectives. Therefore, authors of such a fallacy tend to oversimplify complex issues, distort arguments by excluding a wide variety of useful information, manipulate or goad an audience into arriving at a specific and often false or misleading conclusion.

[48] Hamby, B.W. (2007) *The Philosophy of Anything: Critical Thinking in Context*, Kendall Hunt Publishing Company, Dubuque Iowa

[49] Paul, Richard. (1995) *Critical Thinking: How to Prepare Students for a Rapidly Changing World*. 4th ed. Foundation for Critical Thinking

[50] Paul, Richard and Elder, Linda. (2006) *Critical Thinking Tools for Taking Charge of Your Learning and Your Life*, New Jersey: Prentice Hall Publishing

[51] David Carl Wilson (2020) *A Guide to Good Reasoning: Cultivating Intellectual Virtues* (2nd edition) University of Minnesota Libraries

[52] Gould, S. J. (1996). "A Cerion for Christopher". *Natural History* 105 (Oct.): 22–29, 78—79

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➢ *Appeal to Ignorance Fallacy*

This fallacy which is also known as an appeal to ignorance fallacy, falsely and fallaciously asserts that something is true because it has not yet been proven false, or vice versa (i.e. false because it has not been proven true). Therefore, this fallacy exists in two forms, namely the affirmative form (arguing that something must true because it has not yet been proven false), or the negative form (arguing that something must be false because it has not yet been proven to be true). For example, one may attempt to claim that some object or a phenomena does not exist only because there is no definitive proof for that phenomenon. Additionally, one may argue that paranormal phenomena must exist because no one has convincingly or irrefutably shown that they do not.

➢ *Hasty Generalization Fallacy*

The hasty generalization fallacy arrives at a conclusion rather too quickly, i.e. jumping to conclusions without careful and complete consideration. It typically draws a conclusion based on an extremely small or an unrepresentative sample. For example, one may wish to conclude that all members of a nationality have a specific negative or undesirable characteristic based on the observed behavior of a few random and biased or non-representative sample of individuals from that group. This kind of fallacy also therefore naturally overlooks other explanations or causes including contradictory ones, and may therefore also throw a study or an investigation completely out of gear.

➢ *Red Herring Fallacy*

A red herring fallacy is a form of a logical fallacy where a party introduces an irrelevant topic to distract from the original issue or argument, with a view to confuse, confound or mislead the audience. This fallacy involves clandestinely and surreptitiously introducing an irrelevant topic as a digression in order to distract from the main or the central issue. For example, this may involve cleverly and deviously changing the subject during a scientific debate to avoid discussing or addressing a key point, and deflecting attention away from it. For example, Romila Thapar spoke of the now defunct Aryan invasion theory as a red herring in an all-India history conference held in Varanasi in 1969, even calling it the biggest red herring dragged across the path of historians in India. The term owes its origins to smoked herring which are used to attract dogs in a hunt.

➢ *Non Sequitor Fallacy*

A "non sequitur" fallacy is another important fallacy in science. It literally means "it does not follow," (This is a Latin term) and occurs when a conclusion does not logically follow from the given premises, reasoning or evidence, and is not supported by them. In order to detect such fallacies, researchers must look for statements that are not correlated with other statements, and isolate absurd statements or statements that sound too good to be true. Smoking gun tests must naturally be devised to ensure that such errors or fallacies do not take place. Another form of a non-sequitor is a causal fallacy, which also known as a “false cause fallacy”, occurs when a researcher incorrectly or fallaciously assumes that one event or action caused another, when as a matter of fact, it really did not. Therefore this is a case of confusing correlation with causation, ands arriving at “cause and effect relationships” without adequate evidence. In a few cases, the cause and the effect may be both mixed up, though this may be relatively rare. In some other cases, effects may be traced to only one cause, while in reality, there are several hidden or underlying causes behind the occurrence or a manifestation of an observed event.

➢ *Appeal to Consequences Fallacy*

The "appeal to consequences" fallacy (which is also sometimes known as the “argumentum ad consequentiam fallacy” in science) occurs when a researcher comes to the conclusion that a statement, belief, or hypothesis is true or false solely adjudging it based on whether its consequences are desirable or undesirable. Therefore, this fallacy involves arguing that an idea must be either true (or false in some cases) solely because it could lead to good (or in some cases bad) outcomes. For example, we may wish to state that if we did not accept the idea of a divine creator, there would be chaos and disorder, so, we must believe in the idea of a divine creator. This fallacy comes in both positive and negative forms, and is similar to the affirming the consequent fallacy. In case of affirming the consequent fallacy, which is a much more specific fallacy, an individual simply assumes that if A implies B, and B is true, then A must also be true. Another related fallacy is a slippery slope fallacy. In the case of a slippery slope argument or fallacy, a course of action is rejected only because slippery slope advocates argue or believe that it will lead to one or several undesirable or unknowable end or ends. The "bad reasons fallacy," which is also known as “Argumentum ad Logicam” or simply the "fallacy fallacy," is yet another fallacy. It arises from the error of assuming a conclusion is false only because the arguments supporting it are flawed or contain fallacies.

➢ *Bandwagon Fallacy*

The bandwagon fallacy, also commonly and popularly known as the appeal to popularity or agumentum ad populum, is a logical fallacy that argues something is true or good simply because many or most people believe or do it, while at the same time, ignoring evidence or reason. The bandwagon fallacy therefore occurs when someone assumes that because a belief or action is popular, or believed in by most people, it must be correct or desirable. This is veritably and naturally a fallacy because the popularity of an idea does not automatically make it correct or valid, and people may believe due to something due to ignorance, and mass deception can often occur.

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➢ *Argument from Incredulity*

The "Argument from incredulity fallacy" (which is also known as the "appeal to common sense" or "divine fallacy") occurs when the researcher asserts a proposition is false simply because they find it difficult or hard to accept, imagine or believe, because it does not align with personal beliefs or past experiences. The researcher may therefore choose to ignore, or brush under the carpet, rather than analyze or examine presented evidence or take resort to logical reasoning.

➢ *Probabilistic Fallacy*

A "probabilistic fallacy" is a type of logical error that occurs when a researcher reasons about probabilities, while ignoring or misinterpreting basic probability rules. Base rate neglect occurs when people disregard the overall prevalence or the base rate of an event when making judgments based on probabilities of events. Conjunction fallacy is said to occur when people believe that the probability of two events happening together is higher than the probability of one of them happening in isolation, even when logically the single event is more likely. Appeal to probability or possibility fallacy assumes that something is likely to happen or is absolutely certain only because it is possible, ignoring the extremely low probability of the event actually occurring. The appeal to probability fallacy, is also known as "possibiliter ergo probabiliter" fallacy or the "possibly, therefore probably" fallacy. The conjunction fallacy is another kind of fallacy where people erroneously and fallaciously believe that a specific combination of events (also known as "a conjunction") is more probable than one of the individual events alone, thereby violating the laws of probability. This kind of a fallacy is relatively less common in the real-world.

➢ *Masked Man Fallacy*

The "masked man fallacy" is a logical fallacy that occurs when someone incorrectly assumes or mistakenly believes that if two descriptions refer to the same entity, they can be freely substituted or used interchangeably in all contexts and dimensions, which may naturally not always be the case. This fallacy is sometimes known as the intentional fallacy or the epistemic fallacy, and is relatively quite common in science.

➢ *Argument from Moderation*

The argument from moderation fallacy (which is also known as middle ground fallacy, false compromise fallacy, fallacy of the mean, argumentum ad temperantiam etc) – falsely or incorrectly assumes that a compromise between two positions is always correct, though in the real and in the practical world, it may not always be so.

➢ *Continuum Fallacy*

A continuum fallacy (which is also variously described as a line-drawing fallacy, fallacy of the beard, sorites fallacy, bald man fallacy, fallacy of the heap, decision point fallacy etc) – involves improperly rejecting a claim on the grounds that it is imprecise. The continuum fallacy, also arises when a researcher fallaciously holds that just because there is a gradual transition, spectrum, gradient, or a continuum between two different or distinct states, the states themselves are not distinct, properly defined or do not even exist.

➢ *Modal Fallacy*

Modal fallacy arises when there is a confusion or a mix-up between the terms necessity and sufficiency. Therefore, in such a case, the dictum of necessity or possibility is incorrectly applied to a proposition, thereby confusing what is necessarily true with what is only possibly true. In the real world what is necessary may not always equate to what is sufficient. A modal scope fallacy on the other hand, arises when a degree of unwarranted necessity is placed in the conclusion, and the scope of what is possible is confused with the scope of what is merely true.

➢ *False Equivocation Fallacy*

Equivocation refers to the deliberate and intentional use of ambiguous language to conceal the truth or to avoid committing oneself; another word for this is prevarication which is the act of avoidance of speaking out the truth. The false equivocation fallacy, which is also often known as equivocation, is said to occur when a key term or phrase is erroneously used loosely and ambiguously, with different meanings within the same text, premise, or argument, (without laying out or specifying different contexts of usage or different layers or subtle shades of meaning) thereby naturally leading to a misleading or invalid conclusions. The fallacy exploits the ambiguity of language, making an argument seem valid when it is due to subtle and sometimes imperceptible differences in meaning.

➢ *False Equivalence Fallacy*

A false equivalence or false equivalency is a type of an informal fallacy (An informal fallacy is taken to mean an error in reasoning that stems from the content or context of an argument, and not from its structure) in which an equivalence (the state of being equal or similar) is inferred between two subjects based on either flawed or incorrect reasoning. This fallacy is sometimes referred to as a "fallacy of inconsistency". This is akin to the English idiom of "comparing apples and oranges." This fallacy is also sometimes committed when only one or just a few shared traits between two subjects show equivalence, though complete equivalence is not the logical result.

➢ *Fallacy of Composition*

Fallacy of composition arises when individuals assume that something that is true of a particular of a specific part of a whole must also be naturally and generally true of the whole. In such a case, an inference is made about a whole based solely and exclusively on the attributes and characteristics of its parts, without considering the whole's unique properties or interactions with its different parts and other entities as well.

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- *Fallacy of Division*

Fallacy of division occurs when individuals assumes that something that is true of a composite entity must also be naturally and generically true of all or some or all of its parts. Therefore, it is assumed, and often fallaciously so, that the individual parts have the characteristics of the whole. This kind of a fallacy is one of the most common examples of an informal logical fallacy. The fallacy of division is the exact opposite of the fallacy of composition. Another similar fallacy is an ecological fallacy. An ecological fallacy arises or occurs when researchers draw conclusions about individuals residing within an entity or a group, based on group level data alone, fallaciously assuming that the characteristics, attributes or associations observed at the group level also apply to individuals within that group.

- *Existential Fallacy*

The existential fallacy is a very important type of formal logical error. In such a case, an argument incorrectly infers the existence of something (in other words, a particular conclusion) from premises that do not imply or guarantee its existence (in other words, the premises are neither universal or all-compassing).

- *Circular Reasoning*

Circular reasoning, which is also sometimes known as "begging the question" fallacy, is a logical fallacy where an argument's conclusion is assumed to be true within the premises itself, whereby the conclusion is reiterated and represented as evidence, rather than providing independent support. In such as case, the argument may restate the conclusion in a different way, thereby misleading other researchers and the general public as well. Therefore, if proposition A is dependent on proposition B, and proposition B is also likewise on proposition A, a circular reasoning, or a circular error is said to result.

- *Cherry Picking Fallacy*

The "cherry-picking fallacy" is the act of conveniently and selectively (i.e. misleading) presenting evidence or data that supports or appears to support a particular argument while at the same time, ignoring all forms of contradictory evidence, thereby creating a biased and misleading impression among the general public. This kind of a fallacy is also known as the fallacy of incomplete evidence, and as such distorts the truth badly and damages the cause of science. This type of fallacy is also sometimes known as nut-picking, selective amnesia, suppressed evidence, argument by half-truth, and fallacy of exclusion.

- *Entitlement to Opinion Fallacy*

As per this fallacy, each researcher fallaciously argues that he is entitled to his or her own opinion just like everybody else. In other words, just because A is entitled to his own opinion, B is also entitled to his own opinion, regardless of whether his is right or wrong. This kind of analogy and reasoning has been used by some Marxist historians in India who state that all schools of thought have been encouraged in Indian historiography including Marxist, Hindutva, and the liberal schools of historiography. In such a case, debate and mutually beneficial dialogue are generally preempted, leading to isolated silos of thought.

More and more fallacies need to be identified based on discourse analysis, and this is what we have been arguing all along. Smoking gun tests must also be identified against each of these fallacies, and a composite and a comprehensive list gradually built up, regardless of the time or effort that it takes. Therefore, we will be killing two birds with one stone, if not more. We will resist the temptation of pretending to draw to complete lists, because it would be highly fallacious and misleading at the very outset.

II. CONCLUSION

The primary objective of this paper has been to develop proper and comprehensive guidelines for developing criteria which are widely known as smoking gun tests for ascertaining and measuring objectivity, accuracy, precision, and rigour in relation to scientific output and scholarship. We therefore began this paper by attempting to define what research and scientific method were, and then correlated them with other concepts proposed and espoused in this paper such as objectivity, objectivity in mindset, certainty, precision, exactitude, and limits to objectivity. We also then vetted and ratified our concepts with many of the concepts proposed in several of our earlier papers on scientific method over the years, and other general and widely-known scientific concepts and methods too. The twin concepts of discourse analysis and content analysis were also reviewed in detail, and we then proposed a four stage model and approach in this paper, namely the execution of a formal discourse analysis and content analysis, the identification and categorization of fallacies including new ones as a part of a continuous process of identification and categorization, and the creation of objective criteria and smoking gun tests to align with these fallacies, thereby compensating for them or rendering them invalid as the case may be. As an intrinsic part of this approach and technique, limits and barriers to objectivity in scholarship were also analyzed.

We believe that this will be an indubitable method because all methods can arguably be compartmentalized into logical fallacies. Some examples were also provided in support of the above method, though tests can only be continuously developed and added upon as a part of an elaborate and a protracted and continuous process that may span several years, if not decades. We therefore hope, expect, and anticipate that this will become an important part and parcel of twenty-first century scientific method, with rich rewards in store for myriad facets of scientific endeavour and activity, as this can not only be used in various disciplines of

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the social sciences such as historiography, sociology and anthropology, but in most other fields of the natural and physical sciences too, to equally good effect. Therefore, our contention is that scientific method must not only be taught in schools and colleges to students from an early date, it must also be brought upto date, and must change with the times. This will naturally lead us all to scientific progress at the speed of light with ripple and cascading effects, and usher in a new age of rapid scientific progress, by catapulting both the quantum and quality of scientific activity to an altogether higher trajectory and league.