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Enforcing Absolute Transparency in Research: Absolute Transparency as an Eventual and an Essential Prerequisite of Contemporary Twenty-First Century Research

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Abstract:- This paper is probably our umpteenth and umptieth in our litany of paper on scientific method, and our advocacy of the need to bring it uptodate to suit the needs of the present time. We begin this paper aptly by defining what research is, what scientific method is, and follow it up by debating and discussing the bare essentials of transparency, objectivity, and objectivity in mindset. We explain why transparency is of paramount important to scientific endeavour, and can by and large eliminate scientific fraud and misconduct too. We also explore and summarize the current state of transparency in research, and review efforts made by "The Center for Open Science" which promotes transparency in research and puts out guidelines, on issues such as citation standards, data transparency, analytic methods, design and analysis transparency. Various types of transparency such as data and method transparency and reproducibility are also probed and investigated in this paper, along with value ethics and publication ethics. There are several reasons we write this paper. The first is that the ideals of this movement need to be spread among all and sundry because awareness is generally lacking, particularly in developing parts of the world, secondly we need to merge this with the globalization of science movement, and promote better and greater cross-cultural research design, third because there are too many ideologies rampant in science, fourthly because the ideals of this movement need to be incorporated into scientific method as required, fifthly, because an integration with our other papers on scientific method is required, sixthly because universities and research organizations need to issue or come out with their standards, and seventhly because suitable cascading changes in pedagogy and curricula as required.

I. INTRODUCTION

"A lie can travel half way around the world while the truth is putting on its shoes." - Mark Twain

"We believe that transparency is needed to create trust, and it's also needed to create a dialogue" - Julie Sweet

"The single most important ingredient in the recipe for success is transparency because transparency builds trust" - Denise Morrison

This paper is probably our umpteenth and umptieth in our litany of paper on scientific method, and our general advocacy of the need to bring it uptodate to suit the needs of the present time. We begin this paper aptly by defining what research is, what scientific method is, and follow it up by debating and discussing the bare essentials of transparency, objectivity, and objectivity in mindset, as a corollary and an extension to our previous observations on the issue. We explain why transparency is of paramount important to scientific endeavour, and can by and large eliminate scientific fraud and misconduct too. We also explore and summarize the current state of transparency in research, and review efforts made by the pre-eminent "The Center for Open Science" which promotes transparency in research and sets forth guidelines, on issues such as citation and recognition of other original intellectual contributions, data transparency, analytic methods, (code transparency), design and analysis transparency. Various types of transparency such as data and method transparency and reproducibility are also probed and investigated in this paper, along with other bare essentials such as value ethics and publication ethics too. There also needs to be absolute transparency regarding the methods,, methodologies, tools and techniques used, and the assumptions made. We also consequently believe that the twenty-first century will be one where scientific method will be adequately emphasized.

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There are several reasons we write this paper, and wish to promote the ideals stated therein. The first is that the ideals of this movement need to be spread among all and sundry because awareness is generally lacking, particularly in developing parts of the world, secondly we need to merge this with the globalization of science movement, and promote better and greater cross-cultural research design, third because there are too many ideologies rampant in science, fourthly because the ideals of this movement need to be incorporated into scientific method as required, fifthly, because an integration with our other papers on scientific method is required, sixthly because universities and research organizations need to issue or come out with their standards eventually and in due course, and seventhly because suitable corresponding and cascading changes in pedagogy and curricula as required at least in the long term. In sum, we still have a long, long way to go, and we need to create and generate more awareness in this regard, among researchers, and among the general public at least now because the underlying process may be long drawn out and protracted. This paper is therefore presented only as component of our larger series of papers on scientific methodology all of which are suitably amalgamated and integrated in the interests of consistency and coherence. [1]

- *What is Research?*

The term "research" is being increasingly used today in the context of the twenty-first century, as it is being seen as central to human and societal progress, and is associated with the rapid escalation of science and technology as well. The origin of the term "research" is generally attributed to the Middle French "recherche", meaning "to go about seeking", which in turn is derived from a much older French term "recerchier," meaning "to search", and its reliable first use can be traced back in the year 1577. According to the Advanced Learner's Dictionary of Current English, research is "a careful investigation or inquiry especially through search for new facts in any branch of knowledge". Redman and Mory, the co-authors of the book "The romance of research", define research as a "systematized effort to gain new knowledge". According to Clifford Woody's perspective, research comprises a series of distinct steps such as "defining and redefining problems constantly and continuously, formulation of hypothesis; collection, organizing and evaluation of data in order to prove or disprove hypothesies, sound and thorough investigation, and reaching conclusions". According to Rajasekar et. al. (Rajasekar 2006), research is a logical and systematic hunt for new and useful information, or new perspectives on a given issue or topic. It represents a structured and holistic investigation that leads to solutions to various common scientific and social problems by means objective and systematic analysis. It is therefore, a search for knowledge, and is a discovery of hidden truths, and is often an exciting and a romantic voyage of discovery.

Slesinger and Stephenson in the Encyclopedia of Social Sciences Research published in the year 1930, define research as "The manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art." This definition is somewhat different from other traditional definitions of research, and we reproduce it here on account of its relative novelty. Several notable thinkers contributed immensely to scientific methodology, and among these are more prominent ones such as Roger Bacon and Francis bacon, and lesser known ones such as Paul Felix Lazarsfeld. Research is also therefore, not only a systematic and systematized process, but it can be extremely daunting and challenging, while being an exciting voyage of discovery at all times. Structure and systematicity differentiate research from non-research, and from other frivolous pursuits at the same time. It is also extremely creative and useful to science and to society as it increases the body of scientific knowledge available greatly to them. In sum, it is a structured knowledge creation process, and is as deep, comprehensive, superficial or shallow as the situation merits, warrants, or demands. It may also be basic or applied, primary or secondary, and we have discussed the various types of research in great detail in our previous publications. Researchers typically select the research problem or the research question carefully, and apply research methodologies extremely carefully as well. Ethics must be followed in all stages of the research, and researchers must also have a rock solid and a bulletproof reputation, and no temptation to deviate from accepted norms. [2] [3]

- *What is Scientific Method?*

The scientific method is a systematic and a structured approach to knowledge acquisition that involves the formulation of hypotheses and testing and modifying them suitably through further meticulous and critical examination and scrutiny. The term has been applied and used since at least the seventeenth century, though progress has somewhat plateaued and slowed down in recent times, and this is a rather unfortunate state of affairs. Scientific method not only requires structure, sound analysis and a healthy dose if skepticism, but also transparency, and the latter is somewhat lacking in present-day research. The entire gamut of scientific method encompasses raising generally pertinent and relevant questions, formulating hypotheses, conducting experiments,

[1] Marburger, John Harmen III (10 February 2015). *Science policy up close*. Crease, Robert P. Cambridge, Massachusetts: Harvard University Press

[2] Howell, Kerry E. An Introduction to the Philosophy of Methodology. SAGE

[3] 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

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literature survey and review, making observations, performing analyses, and arriving at conclusions. The order of the steps generally remains the same, though it may change in certain circumstances.

➢ *What is Transparency?*

The word "transparency" is a widely used term in the English language, and often in daily parlance as well. The term means the quality or attribute of something being done in an open way without harbouring any secrets. The term is also associated with honesty, openness and sincerity. Transparent activities are also easy to perceive, see through and detect as opposed to non-transparent ones. Research must always be transparent, and all aspects of research including data employed, tools and techniques, must be laid bare to other researchers and the general public. In sum, an entire traceability of research methods and methodologies along with data and assumptions used, must be clearly and unequivocally established. Research must also be self-contained, and all aspects of research, and controversies, anomalies and inadequacies surrounding it must be adequately and sufficiently addressed. For example, we have theories such as the Out of Africa theory, the Paramunda Indus myth, the Vedic Indus hypothesis, and the Dravidian Indus hypothesis. Have they been presented transparently enough? Are they all logically self-contained? The answer alas is a thumping or a resounding no. A lot more work needs to be done in the present century to improve the overall quality of science, and we must all unanimously and harmoniously work towards it. [4] [5]

➢ *What is Objectivity?*

Simply put and simply explained, objectivity is the quality of being objective and transparent in all aspects and facets of activity. It is an attribute and an ideal that must be cherished, and carefully nurtured, fostered, inculcated and practiced, not only in scientific endeavour and scientific activity, but also in all walks of life regardless of the time or effort involved. Objectivity in scientific research can only be accomplished or achieved when personal biases and personal prejudices do not interfere with the process of scientific activity, and the conclusions reached. Scientists must naturally strive to reduce or eliminate bias and non-objectivity in their research output, and this must be seen as a gold standard; all other ideologies and trivial considerations must be left by the wayside. Biases in this context include cognitive and confirmation bias too. The core and everlasting underlying assumption of objectivity is the idea that truth exists independently and unaffected by an observation or investigation, and that the researcher should not pollute contaminate the truth with his own petty bickering. Poor quality research or inappropriately conducted research will more often than not, have an aggregate net negative downstream effect, and we had proposed a concept known as QEPIS (or "Quantification of the effects of poor or Ideologically-driven scholarship") in a couple of our papers on Twenty-first century historiography. Science, not too long ago, took an alarming wrong turn as many post-modernists have harped ad nauseum on the subjectivity of interpretation. Marxists too seek to promote this in order to protect their own cherished dogmas and ideologies. We need course corrections now, and before it is too late. This must be a well-meaning and orchestrated agenda in twenty-first century science. Ideology-driven people, your time is up! Every researcher must also possess what we may call an "objectivity in mindset". This will naturally be an essential pre-requisite for progress and objectivity itself, and we have been emphasizing this all along. Per this doctrine researchers must be absolutely neutral to all outcomes, and must not allow their cognitive biases to wander, or interfere with them. In order to better understand and appreciate the fundamentals of good scientific research, we request reader to read the paper "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." This paper was published by us in the year 2023, and it would be both pointless and futile to reiterate the contents of this paper here.[6]

➢ *The Current State of Transparency in Research*

Research transparency is an extremely important and crucial component of scientific research, and must even be intrinsically and fundamentally built into research design, and into research method. It requires empirical and data-driven processes and approaches throughout the research lifecycle. This includes many different aspects of research such as data collection, data analysis and sampling. Reproducibility and verifiability are also important hallmarks and crucial components of methodologically sound research and must be followed assiduously at any cost. We have been discussing and debating the core characteristics of bona fide research in many of our previous papers that dealt with the philosophy of science and scientific method, and readers may refer to them as and when required. We also will provide snippets of these papers as and when required to offer more meat and substance to this paper – so that all the papers cohere into a logical whole. We need a lot more work on definitions regarding research methodology, and aspects that differentiate

[4] 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

[5] 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

[6] 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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epistemologically sound research methodologies from more dubious ones - the latter are referred to as questionable research practices. We are only now beginning to question research practices carried out by older generations of researcher and scholars, and put academically rigorous standards in place. This movement is barely a few decades old, and can be traced to the dawn of the present – i.e. twenty-first century. It is bound to take some more time before it gathers momentum and steam. This will be well worth the wait because it holds the potential to catapult science to an altogether higher league.

Since around the turn of the present century, researchers have increasingly begun to call into question certain structural and recurrent issues in research methodology necessitating deep, foundational, fundamental and structural changes in virtually all stages of the research process. This has become core and vital to the open science movement, a movement that we wholeheartedly endorse and support. The open science movement also seeks to make scientific research, scientific data, and scientific publications freely accessible to all other researchers and downstream researchers. This movement also promotes collaboration, transparency, debate, dialogue, reproducibility, and open access among other things, and frowns upon older models such as pay and subscribe models. This approach also seeks to promote the sharing and wide dissemination of research approaches, plans, techniques and strategies among collaborators – including those in other parts of the word - , materials, data, and papers. It also discourages racism, ethnocentrism, and xenophobia in science. Other knowledge systems including ethnic ones are also examined and examined with the critical eye, and are not summarily jettisoned without examination. The movement also seeks to promote the ideals that science is for all and sundry, and is necessary and essential for the benefit of mankind. Open source software, and citizen science are also promoted, along with the necessary checks and balances such as plagiarism check and author background review. Transparency has become one of the core and central values of this "open science" movement, which not only encompasses open and transparent publication practices, but also many aspects of research methods, processes and. New common standards for research transparency, such as the "TOP Guidelines", (or transparency and openness promotion guidelines comprising eight modular standards) which are promoted and accepted by funders and researchers, and are applied to journals and publishers, have also been formalized in this regard to increase the level of transparency in research, and to improve research outcomes.

The application of "TOP guidelines" are measured by the "TOP factor" – this metric, enforced by the mechanism of a composite rubric, seeks to measure research transparency best practices, and grade and evaluate them accordingly. The Center for Open Science promotes these guidelines, and the eight modules are citation and recognition of other original intellectual contributions, data transparency, analytic methods, (code transparency), design and analysis transparency where the entire research process must be transparent and non-ambiguous, preregistration of studies, preregistration of analysis plans, and replication. The entire guideline is titled, "Guidelines for Transparency and Openness Promotion (TOP) in Journal Policies and Practices "The TOP Guidelines" Version1.0.1, and can be downloaded from the internet and read online free of cost. The Center for Open Science is itself a non-profit science and technology organization based out of Charlottesville, Virginia in the United States, and its core mission is to "increase the openness, integrity, and reproducibility of scientific research." This organization was founded by the American social-cognitive psychologist Brian Nosek and Jeffrey Spies in 2013, and was funded by the Laura and John Arnold Foundation – a transformational philanthropy organization founded by the duo, among some others. Jeffrey Spies later founded a movement called SHARE to further his objectives. This movement has given open and transperant science a much needed shot in the arm. Prior to this, only a handful of intellectuals such as Francesco Redi had emphasized the importance of transparency in research processes and methods. Later, in 2018, Vicente-Saez and Martinez-Fuentes also greatly contributed to the open research initiative, by disseminating and popularizing its ideals. The movement is now slowly but surely, gathering movement and stream. It will take some more time before it becomes mainstream.

There are several reasons we write this paper. The first is that the ideals of this movement need to be spread among all and sundry because awareness is generally lacking, particularly in developing parts of the world, secondly we need to merge this with the globalization of science movement, and promote better and greater cross-cultural research design, third because there are too many ideologies rampant in science, fourthly because the ideals of this movement need to be incorporated into scientific method as required, fifthly, because an integration with our other papers on scientific method is required, sixthly because universities and research organizations need to issue or come out with their standards, and seventhly because suitable cascading changes in pedagogy and curricula as required. In sum, we still have a long, long way to go, and we need to create and generate more awareness in this regard. This paper is therefore presented only as component of our larger series of papers on scientific methodology. The old school scholars and the old guard may continue to protest or make noises till the dust settles down, but so be it. Change must and will happen if it needs to happen. People also keep making false and easily debunkable claims with unfailing regularity, and the public is easily confused and mislead given the fact that they are barely properly educated enough to sift the grain from the chaff- we had written extensively about the Indus script before, and had shown why it was a true script, scanty evidence notwithstanding, but the jury is still out on whether we are

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fully correct or not- however, our method is so robust and transparent that we are confident of our efforts against all odds. We have other easily debunkable and controversial claims – for example, the world's oldest alphabet has supposedly been discovered in Umm-el-Marra, Syria. This claim may not hold up to scholarly scrutiny.

Much if not most research today is still however unfortunately based on easily falsifiable and untestable claims – and rampant careerism runs deep in the veins of researchers – the objectives and target audiences are also often not laid down clearly, and sometimes even much more shockingly, research is targeting primarily towards the man in the street, rather than at other researchers. Institutional coherentism is sorely lacking, and careerism runs rife. We also sorely and very badly need epistemic coherentism, a concept we had discussed and debated previously. We also need irreducible simplicity, and mumbo jumbo and weasel talk must be avoided. We need not just rigorous, but also objectivity, and objectivity in mindset. We need balance, and coherence. We need observation reproducibility, (ability to reproduce observations) method reproducibility (being able to repeat procedures of a study without incompatibility), research reproducibility (the ability to duplicate the results of a study), and peer-review reproducibility (ability to reproduce review results), and adhere to similarly high standards in all forms of review and reporting. We also need value transparency – values must be stated clearly upfront, and maintained consistently throughout the research lifecycle. We also need formalized and highly transparent editorial and publication ethics. [7]

The journals publishers and reviewers must also be committed to high quality science, and must possess the necessary standing in academicia. They must also make their editorial policies and editorial practices transparent as far as practically possible. At the same time, researchers must also choose their collaborators and co-authors with care. The reproducibility crisis is an index of failures to reproduce research results time and again, either due to presence of bias, prejudice, and non-rigour, and is as such a failure of modern and contemporary science. We therefore believe that an entirely new generation of researchers needs to take over before palpable change can be seen and felt. That is why Michael Wtizel's, Romila Thapar's, Gregory Possehl's, and DN Jha's are all hopelessly and unsalvageably obsolete and outdated, and as such are not compatible with the canons and tenets of modern contemporary science. When and where have Marxist historians spoken about truth, the cause of science, and objectivity? When have the striven to serve the cause of science, society and the education system fairly, rigorously, and assiduously? Diversity in thought, opinions, beliefs and practices can however still be retained as long as they have a formal epistemological basis. For example, we have had the Anthropologist Karin Knorr Cetina question monist practices in science – She therefore developed a concept that is now known as epistemic cultures. [8] [9]

In sum, open science refers to a rapidly growing movement that aims to make all aspects of scientific research, including the entire process adopted in scientific research, materials, methods, and data, and disseminate it widely to all echelons and section of society, with a view to create a ripple effects, and to increase the percolation and permeation of science and scientific concepts in society greatly. It may therefore as a transparent, accessible and an overarching framework, encompass practices such as publishing open research freely and liberally, spreading the essentials of open access practices among scientists proactively, encouraging scientists to practice to openly sharing data and research methodologies, and encourage non-professionals and specialists (such as amateurs and novices) to share whatever knowledge they may have. Open science must include open scholarship too, and scholars (both individually and collectively) must adopt and practice the concepts of open science as well. These concepts are now gaining currency and traction in different fields of science, technology, engineering and mathematics, (and other fields of study with some commercial application or value) though its adoption remains much slower in the arts, humanities and social sciences. We need a decade or more to change all this. We need both a revolution in one sense of the term as well as a steady progression and adoption (including reinterpretation as and when necessary) of Enlightenment ideas, and ideals.

In a broad sense, we only need a documentation and formalization of concepts at this stage. An earnest desire present in the minds of researchers to contribute to science and to society would also matter greatly, and make a world of a difference. These ideas and ideals must be practiced without inhibition across the spectrum – and this includes both journal publishers and referees or peer-reviewers. We must hasten to add in the same breadth and without inhibition, that we scorn at, and mock the principles of American librarian Jeffrey Beall and others- they may even be surreptitiously and clandestinely intended to block research in developing countries, given that the people in such countries do not normally and generally have access to high end journals and high end resources, or may be relatively monetarily handicapped or impenunious. Good research will always be good research, as long as it is

[7] Introduction to research methods: A hands on approach, Bora Pajo, Sage Publications, 2017

[8] Research Methodology: Methods and techniques, Second Revised Edition, CR Kothari, New Age India Publishers, 1990

[9] Enunciating the Core principles of Twenty-first Century Historiography: Some additional extrapolations and inferences from our studies and observations on Historiography Sujay Rao Mandavilli ELK Asia Pacific Journal of Social Science (ISSN: 2394-9392) in Volume 2, Issue 4 July to September 2018

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bona fide. This is just a hunch at this stage, but we make it abundantly clear awaiting further proof. There may also be different interpretations of the term "open research" as observed and advocated by the sociologists Benedikt Fecher and Sascha Friesike, and seconded by Kevin Elliott, and as such may connote openness throughout all research lifecycle activities. In 2016, Liz Lyon identified transparency as a "third dimension" of open science, and emphasized its centrality to contemporary twenty-first century research.

Let us now aptly review some schools that fall within the umbrella and purview of open research. The "Infrastructure School" states that efficient and effective research depends on the availability of tools and applications, and their widespread adoption and dissemination. Therefore, software, platforms, tools, and services, must be rapidly developed and deployed according to this school. Social networks, and collaboration networks of scientists to share vital data is also extremely vital according to the tenets of this school. According to the "Measurement school", scientometrics and other metrics and measurements form the pillars of modern and contemporary science. Citation metrics and impact factor metrics, along with other metrics such as the h-index and the i-index may also be used. Altmetrics are also being increasingly used to measure the online impact and engagement research publications. The "Public school" strives to make research available to a wider public audience, and also attempts to measure the impact of science on the general public. Scientists must also no longer talk down to the general public as they still often do, but adopt more democratic and visible approaches. This also elides with the "Democratic school" which deals with open access and democratization of knowledge.

The "Pragmatic school" seeks to increase the impact on society through the knowledge creation mechanism, and international collaboration to boot. Concepts revolving around open and transparent science have taken off in a big way in the past couple of years – this is in many ways associated with the decline of colonialism and ethnocentrism. Yet we must not rest on our laurels. It is early days yet, and we have a long way to go before the vision and ideals of open science are realized. Even well-meaning researchers and scientists such as Robert Doyle and Friedrich Steinle, had not been able to realize the ideas of transparency fruitfully. We also need transparency by design; this can be accomplished only by developing an open, seamless, and a transparent workflow of processes. Both processes, and research outputs must be freely and willingly shared, and this is possible only if all parties stand committed to science, and its overall healthy and all-round growth, and all kinds of cultural and non-cultural barriers are similarly and likewise broken down. Universal codes of ethics also need to be developed in science, though there is probably no mechanism by means of which they can probably be enforced.

Some professional bodies also additionally recommend or enforce standards, and there are profession-specific standards to boot. For example, we have the code of ethics and conduct adopted by the American Anthropological Association, and the much more widely known Hippocratic Oath. Such standards may only be recommendatory in nature and may not be legally binding on practitioners. normally call for social and professional accountability and responsibility, honesty, sincerity, adherence to truth, justice, integrity, and respect to fellow colleagues and professionals. Fabrication and falsification of data or evidence are a strict no-no. Subjects or objects of study must be selected fairly, carefully and methodologically, - with informed consent taken - and must also not be harmed in any way during the course of research. Purpose limitation must also be followed. This concept and principle extends to non-human life as well, though of course, their consent cannot be obtained. Ethical and moral dilemmas and quandaries must also be consciously identified from time to time, and in all stages of research, and efforts must be made to sort them out proactively. Laws of the land and intellectual property rights must also always be respected. The services of "Professional ethicists" may also be used, though it is perhaps and probably a long way off, and presently remains a distant pipedream. Our recommendations must be implemented sooner than later – many rational thinkers will even sound the bugle and the clarion call – science may eventually be in an existential crisis, as the general public's awareness levels increase. [10] [11] [12] [13] [14]

[10] Nancy Pontika; Petr Knoth; Matteo Cancellieri; Samuel Pearce (2015). *Fostering Open Science to Research using a Taxonomy and an eLearning Portal*. i-KNOW '15: 15th International Conference on Knowledge Technologies and Data-Driven Business, Graz Austria, 21–22 October 2015. Association for Computing Machinery. pp. 1–8

[11] David, P.A. (2008). "The historical origins of 'Open Science': An essay on patronage, reputation and common agency contracting in the scientific revolution". *Capitalism and Society*. **3** (2): 5

[12] Lewenstein, Bruce V. "Was there really a popular science "boom"?." *Science, Technology, & Human Values* 12.2 (1987): 29–41

[13] David, Paul A. (March 2004). "Can "Open Science" be Protected from the Evolving Regime of IPR Protections?". *Journal of Institutional and Theoretical Economics*. **160** (1): 9–34

[14] Nancy Pontika; Petr Knoth; Matteo Cancellieri; Samuel Pearce (2015). *Fostering Open Science to Research using a Taxonomy and an eLearning Portal*. i-KNOW '15: 15th International Conference on Knowledge Technologies and Data-Driven Business, Graz Austria, 21–22 October 2015. Association for Computing Machinery. pp. 1–8

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➢ *Scientific Fraud and Misconduct*

Absence of controls, checks and balances, (transparency included) may lead to scientific fraud or scientific misconduct, if not poorer quality and non-replicable or non-reproducible results and conclusions. Fraud is intentional deception that is made to achieve a particular unfair or unlawful monetary or non-monetary result, or to falsely gain rewards and recognition. Frauds are common both in civil and criminal contexts and circumstances, though we primarily deal here with the former. Misconduct refers to misbehavior or behaving in an inappropriate or in an unbecoming fashion in the context of a particular situation. A misrepresentation on the other hand, is used to refer to a false or a misleading statement of fact made by one party to another, usually with the intention of deceiving or gaining an unfair advantage in dealings. Scientific misconduct may mean a wide array of things, but most certainly includes in its purview and scope, the violation of the accepted codes of scientific conduct and ethical behavior in the conduct of professional scientific research, and the publication or dissemination of its results to the general public. It represents in sum, a gross violation of the principles of integrity, truth, honest and proper appropriate conduct. According to one definition, scientific fraud refers to: "Intention or gross negligence leading to fabrication of the core scientific message with the intention of gaining or realizing a false credit or acknowledgement to a scientist". According to another definition, it refer to "An Intentional and deliberate distortion and manipulation of the research process by fabrication of data, text, hypothesis, or methods from another researcher's manuscript form or publication; or distortion of the research process in other ways." Scientific fraud or scientific misconduct may be carried out due to a desire to gain fame, glory, monetary rewards or gains, and may be sometimes even be plainly attributed to careerism or career pressure. Fraud can be made easy if there is an implicit trust in the researcher's abilities by other researchers or by the institution itself, or if administrative and operational checks and balances are instituted or put in place.

The discovery of a research or a scientific fraud can send ripples throughout the institution and the broader and larger scientific community. Scientific misconduct may also result in the loss or erosion of public trust in the integrity of science, and the methods and processes involved in scientific research. There have been many instances of scientific fraud that have subsequently come to light. For example, Diederik Stapel, a Dutch social psychologist fabricated much of his data in his studies on human behavior. Hwang Woo-suk, a Korean researcher fabricated a series of experiments in stem cell research, but was subsequently discovered. The Piltdown Man was a paleoanthropological fraud of much larger magnitude promoted by a certain Charles Dawson in 1912, in which incomplete bone fragments were claimed to be the fossilised remains of a missing link between ape and man. This fraud went undiscovered until 1953, when it was fully exposed. The Schon scandal was another major scandal in science and referred to the actions of a German physicist Jan Hendrik Schon who fabricated much of his data and was caught and exposed for his actions. NS Rajaram of far-right infamy also stood accused of faking a horse seal in a Indus valley script pseudo-decipherment case way back in the year 2000. People today also talk about questionable research practices which may stem from an absence of transparency. The concept dates back to a 1992 report of the Committee on Science, Engineering, and Public Policy, but has greatly expanded ever since. By 2016, as many as thirty-four different types of questionable research practices had been identified across the entire spectrum of the research process including hypothesis generation, the formal design of the study, the collection and gathering of the data, the analysis of data, summarization, reporting, and communication of the results to the public, and the number is still increasing. [15] [16] [17] [18]

In addition to the recommendations of the paper "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", which was published by us way back in 2023, researchers also need to bear in mind the following factors and attributes, and at all times.

Assumptions must be stated or laid out as clearly and transparently as possible. An assumption is fundamental and intrinsic to the process of scientific research, and as such refers to something that is accepted as being valid or true without adequate justification or proof. As "non-ideal" as assumptions may be, they are an essential part and part and a process of scientific research, before the researcher may not know everything upfront, and cannot pretend that he does, even though assumptions must be minimized to the extent possible, and kept realistic as well. Researchers B. Othanel Smith and Robert H. Ennis also make a distinction between two classes of assumption, namely "used assumptions", which

[15] 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

[16] 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

17 Implementing "Epistemic coherentism" in twenty-first century science: "Epistemic coherentism" as an essential pre-requisite of interdisciplinary and transdisciplinary research, Sujay Rao Mandavilli, IJISRT, November 2024

[18] 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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the researches uses or makes while formulating his argument and thesis, and "needed assumptions", which are absolutely essential to the process of research. As per Occam's razor, assumptions need to be kept to the barest minimum. This canon and doctrine is attributed to William of Ockham, a fourteenth century English theologian, scholar, logician, and friar, who made many contributions to science. An assumption must also be duly differentiated and distinguished between a postulate which is something taken to be, or implicitly accepted as true for further reasoning and discussion. Both of them need to be stated clearly upfront, and need to be clearly explained and suitably annotated.

Research design refers to a cogent and a coherent strategy that is used to answer research questions through the use of empirical data. A research method refers to a strategy, process, and technique that is used to collect data or evidence to throw further light on a given issue, and extrapolate it suitably or appropriately. A research methodology is much more detailed than a scientific method, and refers to a systematic plan that is used to describe how research must be conducted, and this includes techniques, processes and procedures that are used in order to collect, systematically analyze, and interpret data. These need to be kept as simple and transparent as possible, and the materials and tools used in the research must also be clearly stated upfront (along with citations, references, details of literature reviewed, sampling and data collection strategies if necessary) without much fuss or ado. Likewise, research frameworks and research paradigms must also be stated clearly upfront, and made as transparent as possible, especially if they are complex and not easily understood. We had discussed all these concepts multiple times previously, and there is as such no need to repeat or reiterate them here multiple times ad nauseum.

The merits and demerits of upstream research and source data consulted and used along with the loopholes, lacunae and deficiencies therein must be laid down upfront along with a comprehensive evaluation of upstream research. Internal traceability must be maintained – formally as and when practically possible, and the conditions and essential pre-requirements of internal validity, external validity, epistemic coherentism, institutional coherentism, verifiability, and falsifiability be met. Contradictory evidence must also be considered to the extent and degree that they are available or can be consulted, and an open, transparent and a thorough discussion and evaluation of all relevant and pertinent topics and issues must be accomplished without conscious concealment. There must be no rampant careerism, and research must be as data-driven as far as possible. Ethnography, and grounded research techniques may also be used, though they are yet to become as popular as they should be. Output based criteria is of paramount importance, and as stated in this paper previously, was extensively discussed and exhaustively probed in a previous paper. There must be knowledge of downstream uses of research, and the researcher should be frank, open and transparent about the reliability of his conclusions while avoiding or eliminating the hasty generalization fallacy. Weaknesses in research must be openly and fearlessly communicated as far as possible without the fear of possible repercussions, and social responsibility must take precedence over academic freedom. There must also be a desire to serve society through science, and this principle, if and when followed truly in letter and in spirit, will solve many of the problems that are currently associated with low quality science or subpar science. Peer review must also be properly executed and carried out in regard to science papers and scientific publications, and transparency evaluation and review must be made a part of the formal peer review process. The peer review process of course, must also be made transparent as far as possible, and counter ideologies and ad hominem attacks must not be used.

II. CONCLUSION

This paper has probably been our umpteenth and umptieth in our long litany of paper on scientific method, and in our advocacy of the need to bring it uptodate to suit the needs of the contemporary times, and the altered scenario brought about by globalization, and the seamless flow and exchange of information all across the globe. We had therefore aptly and appropriately begun this paper by defining what research is, what scientific method is, and had then followed it up by debating and discussing the bare essentials of concepts such as transparency, objectivity, and objectivity in mindset. We then also went on to explain why transparency is of paramount important to scientific endeavour, and can by and large eliminate scientific fraud and misconduct too. We also then explored, investigated, and summarized the current state of transparency in research, and also reviewed the noteworthy and praiseworthy efforts made by "The Center for Open Science" which promotes transparency in research and sets out guidelines, on various issues such as citation standards, data transparency, analytic methods, design and analysis transparency. Various types of transparency such as data and method transparency and reproducibility were also probed and investigated by us in this paper, and a brief summary of value ethics and publication ethics was also provided. We had several goals and objectives in writing this paper. The first was that the ideals of this movement need to be spread among all and sundry because awareness is generally lacking, particularly in developing parts of the world, secondly because we need to merge the ideals of this paper with our globalization of science movement, and promote better and greater cross-cultural research design, thirdly because there are too many unreined ideologies still rampant in science, fourthly because the ideals of this movement need to be incorporated into scientific method as required, fifthly, because an integration with our other papers on scientific method is required, sixthly because universities and research organizations need to issue or come out with their standards, and seventhly because suitable cascading

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changes in pedagogy and curricula as required. More research is also necessary and must be welcomed because it retains the innate and the inherent capability to catapult science to an altogether new league and dimension of activity.