9.1: Beyond Research and Statistics

> *All methodologies, even the most obvious ones, have their limits.*
>
> *– Paul Feyerabend in Against Method*[1]

Scientific objectivity is a key characteristic of different elements of science. It embodies the notion that the assertions, methodologies, and outcomes of science, and even the scientists themselves, should not be, or strive not to be, swayed by specific viewpoints, value assessments, communal prejudice, or personal interests, among other relevant factors. Objectivity is often seen as an ideal state in scientific investigation, a compelling reason for appreciating scientific knowledge, and the foundation of science's authority in society.

The field of psychology has earned its reputation by emulating the natural sciences. This perspective of psychology presumes that its theories and methods are impartial and devoid of values (the concept we refer to as ***value neutrality***) and that our investigations about the world are devoid of preconceived notions, vested interests, and subjective interpretations.

However, there are key debates revolving around the concepts of objectivity and value neutrality in research. Can we truly be devoid of preconceived notions and biases while conducting our scientific inquiry?

What is Objectivity and Value Neutrality?

Objectivity is an important concept in science. When we label something as objective, we are expressing its significance and our approval. Objectivity is not a binary concept; rather, it exists on a spectrum. Claims, methods, results, and scientists can exhibit varying degrees of objectivity, and, all else being equal, greater objectivity is generally considered preferable. The term "objective" often carries a distinct rhetorical weight. The widespread admiration for science and its authoritative position in public life largely derives from the perception that science is objective, or at least more so than other modes of inquiry. Therefore, a comprehensive understanding of scientific objectivity is essential for grasping the essence of science and its societal role.

There are different viewpoints on how we can conceptualise objectivity and in this chapter, we will briefly discuss objectivity as 1) faithfulness to the facts, 2) value-free or value-neutral and, 3) freedom from personal biases.[2]

Objectivity as Faithfulness to the Facts

Often, people attribute **objectivity as faithfulness to the facts.** The philosophical basis for this understanding of objectivity lies in the belief that there are factual elements existing "out there" in the world, and it is the responsibility of scientists to uncover, scrutinise, and organise these facts. The term "objective" is thus linked to success; if a statement is objective, it correctly describes some aspect of the world. According to this standpoint, the objectivity of science is determined by its proficiency in identifying and generalising facts, distancing itself from the standpoint of the individual scientist.

Many philosophers argue that the relationship between observation and theory is complex, with influences running both ways. Thomas S. Kuhn (1970) presented a lasting criticism in his work titled, *The Structure of Scientific Revolutions*.[3]

Kuhn's analysis is based on the idea that scientists approach research problems through the lens of a paradigm, encompassing relevant problems, axioms, methodological presuppositions, and techniques. He supported this with historical examples, highlighting that scientific progress occurs within a guiding paradigm that influences individual scientists and community standards in everyday science.

Can observations challenge such a paradigm and advocate for a different one? Kuhn famously emphasizes that observations are "theory-laden" (Hanson, 1958),[4] influenced by a body of theoretical assumptions that shape their perception and conceptualisation.

Objectivity as Value-Free or Neutral-Free

An alternative view of objectivity as faithfulness to the facts is the viewpoint that objectivity is **value-free or value-neutral**. If the aim of science is to generate empirical knowledge, and if disputes involving value judgments cannot be resolved through empirical methods, then values cannot have a place in science. However, is this possible? Let's look at a classic example that relates to what we have been learning about in this book – fitting a mathematical function to a dataset.

Fitting a mathematical function to a dataset involves making a choice for the researcher. They can opt for a complex function, which may complicate the relationship between variables but results in a more accurate fit to the data. Alternatively, they can propose a simpler relationship that is less accurate. Both simplicity and accuracy are crucial cognitive values, and balancing them requires careful consideration. However, philosophers of science often view the presence of values in this context as acceptable. Cognitive values, also known as “epistemic” or “constitutive” values, such as predictive accuracy, scope, unification, explanatory power, simplicity, and coherence with other accepted theories, are considered indicative of the truth of a theory. Consequently, they offer reasons for favouring one theory over another.

In most perspectives, the objectivity and authority of science are generally unaffected by cognitive values, only by non-cognitive or contextual values. These contextual values encompass moral, personal, social, political, and cultural aspects like pleasure, justice, equality, conservation of the natural environment, and diversity. Improper use of such values has historically led to severe consequences, as seen in instances where contextual values influenced scientific agendas with intolerant and oppressive outcomes. For example, during the Third Reich, certain branches of physics were condemned due to the Jewish background of their inventors, and in the Soviet Union, biologist Nikolai Vavilov faced harsh consequences for theories conflicting with Marxist-Leninist ideology. Both regimes sought to align science with political convictions, resulting in disastrous effects.

Less dramatic but perhaps more common are cases where research is biased towards the interests of sponsors, like tobacco companies, food manufacturers, and pharmaceutical firms (e.g., Reiss 2010).[5] This preference bias violates conventional research standards to achieve a specific result and is clearly harmful from an epistemic perspective. Particularly for critical issues such as drug approval or the consequences of human-induced global warming, it is desirable for research scientists to assess theories without being influenced by such considerations. This concept is encapsulated in the value-free ideal, which suggests that scientists should minimize the impact of contextual values on scientific reasoning, particularly in gathering evidence and assessing/accepting scientific theories.

To be **value-free**, scientific objectivity is marked by the absence of contextual values and freedom from cognitive biases. However, for value-freedom to be a reasonable ideal, it must be attainable to some degree. In other words, it must not be completely unattainable. Instead, some people call for **value-neutrality**. Value-neutrality asserts that scientists can, at least in principle, gather evidence and assess/accept theories without making contextual value judgments. Unlike the value-free ideal, the value-neutral thesis is not normative; it addresses whether scientists’ judgments can be, or could possibly be, free of contextual values.

Objectivity as Freedom from Personal Biases

According to this perspective, science is considered objective when personal biases are absent from scientific reasoning or can be eliminated through a social process. Common ways to achieve this objectivity include measurement and quantification. Measured and quantified values are verified against a standard, like stating the height of the Eiffel Tower in meters. This truth is relative to a standard unit and conventions about instrument use, making it independent of the person measuring.

Measurement provides some independence of perspective. For instance, yesterday’s weather in Durham, UK might be considered “really hot” by a typical North Eastern Brit and “very cold” by an average Mexican, yet both would agree it was 21°C. However, measurement doesn’t offer a completely neutral perspective or free us from presuppositions. Measurement instruments interact with the environment, so results are influenced by both the properties of the environment being measured and the instrument used, providing a perspectival view of the world.

However, measurements do not result in a completely unbiased view. Measurement instruments interact with the environment, offering a perspectival view (cf. Giere 2006)[6]. Interpreting measurement results is also crucial. For example, early thermometry, according to Hasok Chang (2004)[7], relied on a “principle of minimalist overdetermination” to find a reliable thermometer with minimal assumptions. However, even reliable procedures can be influenced by the purposes of the scientists involved, especially in the social sciences where normative assumptions, i.e., values, often play a role.

Julian Reiss (2008, 2013)[8][9] argues that economic indicators, like consumer price inflation and gross domestic product, are value-laden. For instance, consumer-price indices assume ethical positions regarding consumer preferences, and national income measures make value-laden assumptions about market exchange. Furthermore, beyond measuring and quantifying characteristics, we use statistics to describe relationships between quantities and make inferences in scientific work. We should know from this book that statistics is certainly vulnerable to personal biases.

Feyerabend's Arguments Against Rationality and Objectivity of the Scientific Method

In the 1970s, Paul Feyerabend became well-known for his criticisms of the scientific method and is considered an important science philosopher. Feyerabend challenged the rationality and objectivity of the scientific method. Feyerabend argued against the "tyranny" of rational methods, stating it hinders science from serving society. He valued diverse, even idiosyncratic perspectives, rejecting the idea that freedom from personal "bias" is beneficial.

Feyerabend's criticism of rational methods starts with the claim that strict rules like the value-free ideal stifle an open exchange of ideas and hinder scientific creativity. In his most famous work, *Against Method* (originally published in 1975), he explores the historical clash between the Catholic Church and Galileo, illustrating that groundbreaking scientific progress often involves violating traditional rules. Feyerabend's "Anything goes" dictum rejects the notion that rational methods can fully capture the irrational ways science deepens understanding.

He argues against an objective, value-free, and method-bound view of science, stating it limits our perspective, creativity, and humanity. Feyerabend sees traditional forms of inquiry, like Chinese medicine, on par with Western counterparts. He criticises appeals to "objective" standards as tools for bolstering Western intellectual authority.

Feyerabend contends that personal perspectives and biases can be beneficial for science. He suggests that scientific research should be accountable to society, advocating for democratic institutions and laymen's involvement in setting research agendas and ethical standards.

Feyerabend supports epistemic pluralism, accepting diverse approaches to knowledge acquisition. Instead of a narrow ideal of objectivity, he promotes a science that respects the diversity of values and traditions, harkening back to its role during the scientific revolution and the Enlightenment as a liberating force against oppression.

Alternative Form of Objectivity: Objectivity as a Feature of Scientific Communities and Their Practices

The following section argues an alternative form of objectivity – objectivity as a feature of scientific communities and their practices. This view of objectivity rejects the idea that objectivity is about correspondence between theories and the world or an individual's reasoning practices. Instead, they assess the objectivity of a collective of studies and the methods guiding scientific research. Three perspectives are discussed: reproducibility and the meta-analytic perspective; feminist and standpoint epistemology; and the incorporation of indigenous knowledge.

Reproducibility and the Meta-Analytic Perspective

In times of crises, such as the replication crisis, the collective perspective becomes crucial. Large-scale replication projects reveal the lack of trustworthiness in findings across various fields. Replicability has long been argued to provide evidence of freedom from biases and scientific artifacts and therefore establish the reliability of the result.

When replication failures in a discipline are notably significant (as we have seen in the discipline of Psychology), it may be inferred that the published literature lacks objectivity – at the very least, the discipline fails to instil confidence that its discoveries surpass mere artifacts of the researchers' endeavours. Conversely, when observed effects can be replicated in subsequent experiments, a form of objectivity is attained that extends beyond the concepts of freedom from personal bias, mechanical objectivity, and subject-independent measurement.

This is what Freese and Peterson (2018)[10] call **statistical objectivity**. It is rooted in the perspective that even the most meticulous and diligent researchers cannot achieve complete objectivity independently. The term "objectivity" instead pertains to a collection or population of studies, with **meta-analysis** (a formal method for aggregating the results from a range of studies) as the "apex of objectivity" (Freese & Peterson 2018). Specifically, combining studies from different researchers may offer evidence of systematic bias and questionable research practices in the published literature. The diagnostic function of meta-analysis in identifying deviations from objectivity is bolstered by statistical techniques such as the funnel plot and the p-curve (Simonsohn et al., 2014).[11] However, it is important to acknowledge that meta-analyses are still vulnerable to biases as authors may choose not to share details about their methods such as specification choices regarding the exact method for computing effect sizes, selection choices for weighting factors, not providing raw statistics used and the script used for their analyses (López-Nicolás et al., 2022).[12]

In addition to its epistemic aspect, research on statistical objectivity also carries an activist dimension: methodologists encourage researchers to publicly share essential parts of their research before commencing data analysis and to enhance transparency in their methods and data sources. For instance, it is hypothesized that the replicability (and hence objectivity) of science will improve by making all data accessible online, preregistering experiments, and adopting the registered reports model for journal articles (i.e., the

journal decides on publication before data collection based on the significance of the proposed research and the experimental design). The rationale is that transparency regarding the dataset and experimental design facilitates the replication of an experiment and the evaluation of its methodological quality. Furthermore, committing to a data analysis plan in advance is expected to reduce the occurrence of questionable research practices and attempts to tailor data to hypotheses rather than making accurate predictions.

Feminist Epistemology

Feminist perspectives challenge traditional notions of objectivity – there are various viewpoints on this matter but in this chapter, we will focus on **feminist epistemology**. Feminist epistemology explores how sex and gender impact scientific knowledge, often rejecting the value-free ideal. Specifically, feminist epistemology underscores the epistemic dangers arising from systematically excluding women from the scientific community and overlooking women as subjects of study. Notable instances include the disregard for the female orgasm in biology, the exclusive testing of medical drugs on male participants, the concentration on male specimens when examining the social behaviour of primates, and the explanation of human mating patterns through imaginary neolithic societies.

Frequently, though not always, feminist epistemologists move beyond highlighting what they see as androcentric bias and completely reject the value-free ideal, focusing on the social and moral responsibility of scientific inquiry. They aim to demonstrate that a science infused with values can still meet crucial criteria for being epistemically reliable and objective. A prominent example of such efforts is Longino's (1990)[13] contextual empiricism. She supports Popper's emphasis on "the objectivity of scientific statements lies in the fact that they can be inter-subjectively tested" (1934 [2002], p. 22)[14], but in contrast to Popper, she views scientific knowledge as fundamentally a social product. Therefore, our understanding of scientific objectivity must directly involve the social process that generates knowledge.

Indigenous Knowledge

> *In indigenous ways of knowing, we understand a thing only when we understand it with all four aspects of our being: mind, body, emotion, and spirit. I came to understand quite sharply when I began my training as a scientist that science privileges only one, possibly two, of those ways of knowing: mind and body.*
>
> *– Robin Wall Kimmerer in Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*

Recognising the importance of diverse knowledge systems, there is a growing acknowledgment of **Indigenous knowledge** as a valuable perspective in scientific discourse. Indigenous knowledge, rooted in the wisdom of Indigenous communities, offers unique insights into ecosystems, biodiversity, and sustainable practices. Incorporating Indigenous knowledge in scientific research is seen as a step toward a more inclusive and holistic understanding of the world. For instance, in indigenous knowledge, nature is commonly depicted as an intricate and interconnected system where each part relies on the others. Humanity is seen as an inherent component of nature, and some indigenous scholars even describe the human-nature relationship as symbiotic. Kimmerer, an Indigenous scholar and botanist, wrote in her book:

> *With a long, long history of cultural use, sweetgrass has apparently become dependent on humans to create 'disturbance' that stimulates its compensatory growth. Human participates in a symbiosis in which sweetgrass provides its fragrant blades to the people and people, by harvesting, create the conditions for sweetgrass to flourish. (164)*

From this text, Kimmerer (2013) notes that sweetgrass relies on human-created disturbance for its growth, establishing a symbiosis where people benefit from the fragrant blades while contributing to sweetgrass flourishing through harvesting. This quote embodies the contextuality that science (as explained above) wants to avoid. In other words, contextuality is the enemy of objectivity. Modern knowledge flourishes through abstract formulations and exists separately from people's lives. In contrast, Indigenous knowledge is deeply connected and harmonious with the lives of the people who created it.

Unlike modern knowledge, which claims superiority based on universal validity, local knowledge is constrained by space and time, and influenced by contextual and moral factors. Importantly, it cannot be detached from broader moral or normative purposes. To achieve universality and validity, knowledge must be dissociated from a larger epistemic framework that ties it to normative and social objectives. Context is local, anchoring technical knowledge to a specific social group in a particular setting at a specific time.

Conclusion

In conclusion, the exploration of scientific objectivity reveals its nuanced and multifaceted nature. Beyond the foundational emphasis on faithfulness to facts, the chapter critically examines the value-free ideal, challenges in achieving freedom from personal biases, and Paul Feyerabend's call for epistemic pluralism. Transitioning to alternative forms of objectivity, the collective perspectives of reproducibility, meta-analysis, feminist epistemology, and Indigenous knowledge underscore the need for a more inclusive and reflective scientific approach. The chapter advocates for ongoing dialogue and a reevaluation of traditional norms, recognising that diverse lenses enrich our understanding of the intricate interplay between knowledge, context, and societal values.

1. Feyerabend, P. K. (2010). *Against method* (4th ed.). Verso Books. ↵
2. Reiss, J., & Sprenger, J. (2020). Scientific objectivity. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy archive* (Winter 2020 ed.). https://plato.stanford.edu/archives/win2020/entries/scientific-objectivity/ ↵
3. Kuhn, T. S. (1970). *The structure of scientific revolutions* (2nd ed.). University of Chicago Press. ↵
4. Hanson, N. R. (1958). *Patterns of discovery: An inquiry into the conceptual foundations of science*. Cambridge University Press. ↵
5. Reiss, J. (2010). In favour of a Millian proposal to reform biomedical research. *Synthese, 177*(3), 427–447. https://doi.org/10.1007/s11229-010-9790-7 ↵
6. Giere, R. N. (2006). *Scientific perspectivism*. University of Chicago Press. https://doi.org/10.7208/chicago/9780226292144.001.0001 ↵
7. Chang, H. (2004). *Inventing temperature: measurement and scientific progress.* Oxford University Press. doi.org.10.1093/0195171276.001.0001 ↵
8. Reiss, J. (2008). *Error in economics: The methodology of evidence-based economics.* Routledge. ↵
9. Reiss, J. (2013). *Philosophy of economics: A contemporary introduction.* Routledge. ↵
10. Freese, J., & Peterson, D. (2018). The emergence of statistical objectivity: Changing ideas of epistemic vice and virtue in science. *Sociological Theory, 36*(3), 289–313. doi.org/10.1177/0735275118794987 ↵
11. Simonsohn, U., Nelson, L. D., & Simmons, P. P. (2014). P-Curve: A key to the file-drawer. *Journal of Experimental Psychology: General, 143*(2), 534–547. doi.org/10.1037/a0033242 ↵
12. López-Nicolás, R., López-López, J. A., Rubio-Aparicio, M., & Sánchez-Meca, J. (2022). A meta-review of transparency and reproducibility-related reporting practices in published meta-analyses on clinical psychological interventions (2000-2020). *Behavior Research Methods, 54*(1), 334-349. https://doi.org/10.3758/s13428-021-01644-z ↵
13. Longino, H. E. (1990). *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton University Press. ↵
14. Popper, K. (1934/1968). *The logic of scientific discovery* (2nd ed.). Harper and Row. (Originally published in 1934 as Logik der Forschung by Julius Springer) ↵