Research Article

HUME, Paradigms, and the Debate on Psi

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Some skeptics of the psi data have considered David Hume's argument in his essay *On Miracles* as a potent weapon against the psi evidence. Following their interpretation of Hume, they typically argue that, because the findings on psi must be viewed as violations of the laws of nature, the most likely interpretation is the presence of questionable research methods or fraud. For a number of reasons, I argue that the psi critics who use Hume in this way have misunderstood his arguments, and that his famous chapter concerning miracles does not offer the resources to dismiss the psi data. In particular, I discuss how Hume's arguments on the nature of causality do not support the sorts of "laws" that psi skeptics have in mind. Another key problem for psi critics is that their core argument generally hinges on establishing principles from a particular domain of inquiry in order to constrain or limit allowable findings in another domain that may have different characteristics and properties. I also explore how Hume's arguments linking our understanding of the world's causal nature with custom and sentiment support a Kuhnian framework that describes scientific practice in terms of paradigms. I then turn to how we might understand the debate around psi through Hume's arguments that our beliefs on matters of fact are to a degree constructed through habit and sentiment.

1. Introduction

Recently, Cardeña (2018) has presented an overview of the extant meta-analyses on *psi*, an umbrella term for anomalous phenomena that include telepathy, clairvoyance, precognition, and psychokinesis.[1] These meta-analyses included various modes or categories of psi, as well as different experimental designs for each category. In his paper, Cardeña claimed that the overall evidence "provides cumulative support for the reality of psi, which cannot be readily explained away by the quality of the studies, fraud, selective reporting, experimental or analytical incompetence, or other frequent criticisms" (p. 1). He also noted that the rigor of the psi experimental methodology has

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increased with time, often including analyses for possible publication bias as well as the quality of the studies.

The psi data remain controversial, and Cardeña's paper was quickly criticized by Reber and Alcock (2019). But these skeptics did not identify any flaws within the methodologies used to produce the findings. They simply argued that the data, accumulated over decades from diverse laboratories, simply had to be wrong. Primarily, they claimed that the psi data conflicted with important principles from physics. Given this position, Reber and Alcock proceeded to invoke Hume's well-known argument against miracles to simply dismiss the data as impossible.

Hume's argument against miracles has attracted skeptics throughout the debate on psi. Price (1955) was the first to invoke Hume this way, using his argument from the chapter *On Miracles,* from his *An Enquiry Concerning Human Understanding,* in order to dismiss Rhine's work testing ESP using Zener cards. First, Price acknowledged that, by normal standards, Rhine's accumulation of evidence should be sufficient to win over skeptics:

> Believers in psychic phenomena ... appear to have won a decisive victory and virtually silenced opposition. ... This victory is the result of careful experimentation and intelligent argumentation. ... Dozens of experimenters have obtained positive results in ESP experiments, and the mathematical procedures have been approved by leading statisticians. ... Against all this evidence, almost the only defense remaining to the skeptical scientist is ignorance. (p. 359)

However, Price then pivoted and unsheathed Hume's argument against miracles. He quoted the following well-cited passage:

> A miracle is a violation of the laws of nature; and as a firm and unalterable experience has established these laws, the proof against a miracle, from the very nature of the fact, is as entire as any argument from experience can possibly be imagined ... no testimony is sufficient to establish a miracle, unless the testimony be of such a kind that its falsehood would be more miraculous than the fact which it endeavors to establish...." (p. 360)

Price noted that, because Rhine's findings are "incompatible with current scientific theory," they qualify as a miracle in Hume's sense. Then, making use of Hume's declaration that no testimony is sufficient to establish a miracle, Price proceeded to dismiss evidence that he acknowledged only paragraphs earlier to have met conventional scientific standards. By arguing that fraud or error is

more likely than findings that conflict sharply with accepted scientific theories, Price argued that we are well justified in rejecting the psi evidence.

Similar arguments have appeared since Price, not always explicitly linked with Hume, but usually focusing heavily on the perceived conflict between the psi data and presumably established principles or laws. Flew (1985) argued that Hume's argument against miracles applies to the psi evidence, because of previous evidence of fraud and the inherently statistical nature of the psi data (which indicates that its effects cannot be demonstrated on demand).[2] Recently, Wagenmaker et al. (2011) included a nod to Hume in their criticism of Bem's (2011) paper on precognition.

Some psi skeptics have recommended a more cautious approach than simply using Hume's argument to justify dismissing the psi data. Kurtz (1985) noted the possibility that scientific prejudices and ingrained habits of thought could lead some to misuse Hume's argument to "ridicule or block novel ideas" (p. xviii). While he argued against using Hume's position to simply dismiss anomalous claims, he did suggest that it provided grounds for being cautious regarding claims that appeared to violate well-established principles or scientific theories. Beloff (1985) also made a case against using Hume's argument to support the view that psi is a priori impossible, noting the many upheavals in the history of science. But Reber and Alcock's (2019) recent account demonstrates that using Hume's miracles argument to simply dismiss the data without citing any flaws remains a viable option. Indeed, using Hume's argument in this way has also appeared in books targeting wide audiences (Carroll, 2016; Pinker 2021). We can also note that the well-known maxim, "extraordinary claims require extraordinary evidence," popularized by Carl Sagan, is generally understood to be a succinct paraphrase of Hume's argument and has found frequent use in the general public domain.

Below, I present Table 1, which extracts a subset of the findings portrayed in Cardeña's (2018) paper. This table offers meta-analyses for 9 different experimental designs, which cover the following psi categories: telepathy (forced choice cards, ganzfield, psi dream studies), remote viewing, precognition, presentiment, and anomalous mind-matter influence (dice, micro-pk, and the Global Consciousness Project). These meta-analyses are based on a total of nearly 1300 studies across diverse laboratories, extending back into the previous century.[3] In 7 out of the 9 cases of experimental design, the *p* values generated by the respective meta-analyses are smaller than 5.7×10^{-8} (the case with presentiment).

As mentioned above, Cardeña (2018) addressed alternative explanations for the data such as selective reporting and poor quality, finding them inadequate. As I noted above, he finds that the quality of the

studies has improved with time. Further, the astronomically low p-values associated with most of these combined studies addressed the question of repeatability. That is, while some studies failed to find statistical significance, all studies pooled together did. Arguably, the combined results of these 1300 studies might put pressure on the skeptics to examine and even shift their prior beliefs against accepting the data. So far, there is little evidence that this is the case. Thus, I wish to examine more closely the justification for not altering these low priors, which appears to be closely linked with Hume's famous essay.

	# Studies	Z	*p*
Forced Choice Cards			
Honorton and Ferrari (1989)	309	11.41	6.3×10^{-25}
Storm et al. (2012)	91	10.82	10^{-16}
Ganzfeld			
Storm et al. (2010)	108	8.31	$<0.10^{-16}$
Psi Dream Studies			
Storm et al. (2017)	52	5.01	2.72×10^{-7}
Remote Viewing			
Milton (1997)	75	5.85	2.46×10^{-9}
Jahn and Dunne (2011)	88	5.42	3×10^{-8}
Precognition			
Bem et al. (2015)	90	6.40	1.2×10^{-10}
Presentiment			
Mossbridge et al. (2012)	26	5.30	5.7×10^{-8}
Dice			
Radin and Ferrari (1991)	73	18.20	< 0.001
Micro-PK			
Bosch et al. (2006)	380	2.47	<0.05
Global Consciousness Project			
Nelson (2015)	461	7.23	1. $2.34\ 10^{-13}$

Table 1. A subset of the meta-analysis summaries of various psi modes, adapted from Cardeña (2018). Z = the cumulative standard deviation from the mean; *p* = the statistical likelihood of obtaining the test results while assuming the null hypothesis is correct. I have limited the results taken from Cardeña to the modes

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of psi I discuss here. In his tables, Cardeña also included psi studies such as non-contact healing and remote influence that did not report the Z values.

In this paper, I argue that the psi critics have misused Hume's arguments against the psi data, which merit serious attention. In particular, I focus on Hume's overall arguments within his *An Enquiry Concerning Human Understanding (Enquiry)*, which includes his argument on miracles, imply for the debate on psi. I'll argue that psi critics depart from Hume's thinking in a number of ways. In the following section, I'll propose that such skeptical arguments typically gloss over the fact that Hume's intended target was the fallibility of testimony around miracles, usually of a religious nature, not anomalous findings in laboratories. This is likely an important omission, because testing under laboratory-controlled conditions is generally designed to rule out at least some of the problems that concerned Hume. In the following (third) section, I'll consider Hume's analysis on causality, the most important argument in his *Enquiry*. Within this context, I wish to clarify that the term *laws of nature* used by psi critics appears to differ significantly from what Hume intended. Hume's well-known arguments on the nature of causality makes questionable the attempts by critics to constrain allowable experimental findings based on limiting principles. I'll argue the problematic nature of deriving limiting principles from a particular domain of inquiry, which are, in turn, exported and used to constrain allowable observations for an altogether different domain, which likely has different properties. In the fourth section, I consider more generally, apart from Hume, the problem of establishing limiting or constraining principles to rule out psi data.

In the (fifth) section that follows, I provide an overview of the psi data, focusing, for convenience, on Cardeña's (2018) recent overview. I'll argue why it is very unlikely that these data were simply the product of fraud and questionable research methods. Then in the next (sixth) section, I'll suggest that Hume's arguments in his *Enquiry* point toward a more institutional view of our understanding in the world, which likely supports Kuhn's view on paradigms. As it happens, Kuhn's framework on paradigms suggests a fruitful way of framing the current discourse on psi, especially in terms of what Kuhn termed the incommensurability between paradigms. I submit that an under-appreciated value of Hume's *Enquiry* is how it supports Kuhn's notion of paradigms, with the current psi debate unfolding as an interesting case. In the final section, I offer a conclusion to the arguments mentioned above.

2. The Use of Hume's Argument on Miracles by Skeptics of Psi

I submit that many psi critics of Hume have based their arguments on an incomplete understanding of Hume's chapter, *Of Miracles,* as well as the surrounding text in Hume's *Enquiry*. Hume, of course, has been recognized as one of the most important critics and skeptics of religion; indeed, in *Of Miracles*, Hume takes aim at what he considered to be an important foundation for religious beliefs, the existence of miracles. From the quote provided by Price (1955), we have noted that Hume argued that a "miracle is a violation of the laws of nature." For Hume, "a firm and unalterable experience has established these laws." That is, our direct experience of events in our lives provides the basis for these laws, and he counsels that accounts that sharply contrast with such events, such as extraordinary tales from religious texts, should be viewed with suspicion.

The focus in Hume's argument regarding miracles is the reliability (or lack thereof) of testimony. He considers various attributes of testimonies that can be taken as credible and authoritative, which include those that agree uniformly with other similar accounts and arise in greater numbers, the manner of the delivered testimony, as well as the character of those providing the testimony. He puts great focus on the types of testimony that are uniform across many reports and that also agree with our own experiences. Hume then examines ways in which those testimonies located in religious texts are found wanting. He noted that such accounts appeared in the distant past and typically arose in remote areas, usually among sparse and undereducated populations. Testimony about a religious marvel often inspires a love of wonder or a kind of excited passion, and these he judges detrimental to more sober reasoning. Also noting that dishonesty in testimony has occurred throughout history, Hume then notes that religious miracles, such as raising the dead, clash strongly with the much more reasonable testimonies that we possess in much higher numbers and that do not clash with our own experiences. Overall, based on the sharp clash between the nature of religious miracles and the more numerous and reliable testimonies available to us, which are also in agreement with our direct experiences, as well as the dubious and unreliable nature of the passions associated with religious miracles, we are justified rejecting such testimony as evidence.

Hume's characterization of problematic testimony, however, fails to include events under laboratory or controlled conditions that are ultimately evaluated through statistical techniques. The psi critics do not make this distinction plain, and thus avoid explaining how Hume's argument transfers to the laboratory, where methods are typically used facilitate repeatability across various experimenters and

laboratory environments. That said, laboratory fraud or questionable research methods have indeed occurred in contemporary science and should treated as unreliable. This suggests that the weight of Hume's argument must be carried solely by the likelihood of fraud, questionable research methods, and error. I shall write more in a later section on this possibility with respect to the psi data.

But simply claiming fraud or poor research practices, without evidence for such, against a relatively large body of work is arguably not to be done lightly. This leads us to question how we might distinguish between anomalous but naturalistic results that conceivably force us to adapt our theory and others that conflict with established theories where we might justifiably dismiss the findings. Psi skeptics have emphasized the latter interpretation, by identifying specific laws or key principles which clash with the psi evidence. But this raises the question of how we establish such laws or principles in a way that justifies dismissal of laboratory generated data.

3. Is Establishing Limiting Principles Consistent with Hume's Analysis of Causality?

Arguments against accepting the psi data generally take the form of demonstrating that these data are inconsistent with what are termed *basic limiting principles*, or alternately, *scientific laws*, based on well-established theories from physics. The inconsistency between psi and such principles (or laws) then provides the basis for claiming the data as unacceptable and more likely resulting from fraud or sloppy research than shedding light on new properties of the world. But can we invoke such limiting principles or laws in such a way to dismiss the relatively large body of empirical data presented in the above table with great confidence? The skeptics would likely answer that such principles or laws are based on our strongest, best-established theories, and thus confidence is justified. But what if the psi data include phenomena that fall in domains where we struggle to understand? Must these areas of inquiry, which might be targeting gaps in our current understanding, be characterized in similar terms, such as properties, mathematical relationships, and other features, as the domains we understand well?

Earlier arguments of this form have relied on Broad's (1949) basic limiting principles (BLTs) to establish that the psi data exceeded the boundaries of acceptable findings (Price, 1955; Flew, 1995).[4] In his words, Broad considered these BLTs to provide a "framework within which the practical life, the scientific theories, and even most of the fiction of contemporary industrial civilization are confined"

(1949). Thus, Broad considered his BLTs as key principles, arguably more fundamental than scientific laws that limited allowable occurrences in the world. Broad classified his BLTs according to the following categories: (1) constraints on the nature of causation (particularly concerning the time order of events), (2) limitations on the influence of mind on matter, (3) the dependence of the mind on the brain, and (4) limits on gaining knowledge in anomalous ways.

The psi data reviewed by Cardeña (2018) do appear to exhibit behavior that falls outside of Broad's limiting principles. However, can we remain confident that experimental findings appearing to violate such limits should be tossed into the wastebasket? I suggest we adopt a more cautious position. It is unclear whether such principles can be usefully employed in areas where we continue to struggle to understand. For example, some interpretations of quantum mechanics propose that consciousness is involved in "collapsing" the quantum wave function, which would appear to violate Broad's second BLP as I have listed them (Stapp, 2017; Chalmers and McQueen, 2021). Broad's third BLP claims that the mind must depend on the brain. However, philosophers of mind disagree on whether a viable theory of consciousness can be based only on processes involving physical matter within the brain. If, as some philosophers argue, consciousness is fundamental—not emergent from physical processes—Broad's third BLP would appears questionable.

More recently, arguments against accepting the psi data have been based on views that they conflict with well-established scientific theories or principles derived from such. Reber and Alcock (2019) attacked Cardeña's summary based on what they viewed as the incompatibility between psi and key scientific principles, which include the law of thermodynamics, the inverse square law, and the necessity of well-understood causal mechanisms.[5] Establishing the conflict between such established principles or laws and the psi data was sufficient for Reber and Alcock to invoke Hume's miracle argument. Similarly, Carroll (2016) argued that the psi data appear incompatible with quantum field theory. Carroll views Hume's notion of the "laws of nature" as interchangeable with the laws of physics (p. 157). Thus, Carroll views quantum field theory as a law of nature that is incompatible with psi.[6]

However, as was the case with Broad's limiting principles, we might question whether such constraining principles or laws continue to hold, as our understanding of the world expands. Such principles or laws are invariably based on well-established theories for areas of inquiry, based on copious experimental testing. But scientific history suggests that we might not be able to characterize areas on the edge of science in the same way. Newtonian physics, for example, performs exceptionally

well in our familiar environment, but does rather poorly on cosmological scales. Similarly, principles established in classical physics break down in the domain of quantum physics. We can note that the property of quantum entanglement appears to violate the inverse square law, a key limiting principle for Reber and Alcock (2019). Given the difficulty of resolving the measurement problem for quantum mechanics, which implies considerable uncertainty regarding the ontology of the quantum world, I suggest it is premature to argue that quantum field theory is sufficiently mature to rule out the psi data.

Some psi critics have used arguments that have not relied heavily on basic or key limiting principles, but instead on the assumption that acceptable data must be congruent with certain fundamental characterizations of physics. For example, Hyman (2010) argued that we cannot properly characterize psi as anomalous because an "anomaly as understood by scientists is a detailed specification on how an observation or experimental outcome deviates from scientific prediction" (p. 48). Hyman proceeded to cite examples from scientific history such as the discovery of Neptune and the perturbations of the orbit of the planet Mercury, both of which violate Newtonian mechanics. Hyman noted that the inherently statistical nature of the psi data contrasts unfavorably with such anomalies found in classical physics. Flew (1995) argued similarly, noting that the inherently statistical nature of psi implies that it is not a phenomenon that can be demonstrated on demand, and therefore cannot be truly replicated.

However, the meta-analysis we have briefly discussed above does suggest repeatability, at least by the standards used in the psychological and biological sciences. It is not uncommon in those fields to establish effects that cannot be demonstrated on demand and that require pooling of various studies, due to the relatively small size of the effects, amid a relatively large number of factors. Utts (1991), for example, found that the effect size obtained from Ganzfeld research compared favorably to clinically recommended uses of aspirin. Such fields as psychology, biology, and pharmaceutical science necessarily use statistical tools to establish causal links that have very different dispositional behavior from physics. An interesting example is the well-established causal link between smoking and lung cancer. There is no controversy about this claim, which is the product of considerable empirical testing. However, this causal link is not a necessary one: we cannot predict with certainty whether a given smoker will develop cancer no matter how much we know about that smoker's demographics, habits, and life history.

3.1. Hume's Analysis of Causality

At this point, we might consider whether Hume's analysis of causality can clarify the problem of establishing principles or laws that can be used to rule out findings that appear outside the bounds of acceptability. Psi skeptics appear to use notions of the laws of nature and laws of physics interchangeably. But Hume (famously) argued that we cannot characterize the causal relationships between objects beyond the regularities we observe between such objects. Hume argued that we simply cannot access causal relations through observation, our only way of establishing matters of fact in the world. As he put it, "All events seem entirely loose and separate. One event follows another; but we never can observe any tie between them. They seem conjoined, but never connected" (Hume, 2007, p. 54).

Thus, Hume offers what some might view as a deflationary view of causality. Our inability to access causal relationships directly through our experience removes any basis for understanding them through our reasoning faculties as well. That is, nothing from our direct experiences justifies characterizing causal events beyond the regularities we observe in the world. Our observation that object (event) B follows from A is the only basis for our notion of causal relations between A and B. We have no deeper understanding of causality beyond the regularities we experience.

The important question for our purposes here is whether a view of causality based solely on regularity possesses the resources to block the findings represented by the psi data. Let's consider how Hume's argument on causality bears on the efforts to establish limiting or confining principles for our world. Considered broadly, the question might be to what degree we might constrain or filter what experimental findings are acceptable in a class of experiments, based on the characteristics or properties obtained from regularities observed from a different class of experiments. Put differently, how strongly should we insist that the behavior that characterizes a class of well-established experiments be extended to limit or constrain acceptable behavior in a substantially different class of experiments, perhaps involving complexities above and beyond the physics laboratory, which would be the case in the biological or psychological arenas? I believe Hume's response to this question is best understood in the chapter where he considers the idea of *necessary connection*. There, he notes that our senses never perceive the necessity or causal link that connects two events together. He considers that there is nothing from our sense experience of object A through which we might perceive a necessary connection and thus know, a priori, its effect on object B. All real knowledge of causes and effects is a posteriori. Thus, Hume's analysis of causality does not provide grounds for establishing limiting

principles or laws extracted from a particular area of inquiry (perhaps what we might characterize as classical physics) to dismiss evidence acquired in a very different area (such as quantum mechanics or consciousness).

4. Constraining Principles beyond Hume

Hume's analysis of causality does not permit the extraction of limiting principles from one domain in order to apply them to another because he resists the notion of any underlying causal power beyond the regularities we can observe.[7] But we might consider whether our modern scientific theories can provide a deeper understanding of the nature of causality that goes beyond regularities. Despite undeniable advances in scientific understanding since Hume's day, however, his rather parsimonious view on causality continues to be influential. At the same time, arguably most scientists and philosophers are realistic about laws governing our world, even though exactly how we are to characterize such laws remains far from settled. Cartwright (1983) has noted that our conventional notions of laws are generally based on experiments conducted in very special environments, far removed from the typical conditions of our complex world. Such views have challenged the notion that laws are rigid, universal, and deterministic. Recently, a framework has emerged that describes causality as dispositional (Bird, 2007; Chakravartty, 2007; Choi & Fara, 2018). Dispositionalism frames the causal nature of the world fundamentally in terms of dispositions, tendencies, capacities, or potentialities. Mumford and Anjum (2011) have argued that quantum mechanics offers strong support for the position that the world is fundamentally governed by tendencies or potentialities. While dispositionalism arguably has more resources in terms of causal powers than Hume's more parsimonious view, it is not easy to see how it has the resources to impose strong limits on anomalous data, given its inherently probabilistic nature.

4.1. Considering Laws and the Problem of Quantum Contextuality

On another part of the spectrum, opinions do prevail that support a stronger view on laws and argue that our modern understanding of such laws is sufficient to rule out the psi data. As noted above, Carroll (2016) claimed that current state-of-the-art quantum field theory effectively rules out the possibility of psi phenomena, particularly in the form of anomalous mind-matter interaction. He argued that "the tenets of Core Theory, and the framework of quantum field theory on which it is based—are enough to tell us that there are no psychic powers" (p. 157). As I have noted, the persistent

gaps concerning what quantum mechanics entails for the world's deeper ontology arguably gives us license to question such a claim.

But in another recent paper, Carroll (2021) acknowledged that "particle-physics experiments typically examine the interactions of just a few particles at a time...." (p. 28) This suggests that Carroll's argument dismissing the psi data may not be accounting for the inherently context dependent nature of quantum mechanics. The Born probabilities within the Schrodinger equation are not fixed; they vary according to such factors as which measurables are selected for observation, as well as the characteristics of the entire experimental setup. Quantum context dependency also affects the degree of entanglement between the observables in the quantum system. Thus, the results from lab experiments involving a very small number of particles provides a weak basis for characterizing or constraining much more complex systems, involving a much larger number of particles.

The problem of quantum contextuality is an especially important consideration for biological systems that exhibit quantum behavior. McFadden and Al-Khalili (2014) described how a group of physicists at MIT, experts in quantum mechanics, became incredulous at the results of research conducted at Berkeley finding quantum processes in the photosynthesis in plants. They believed the results to be impossible and a source of considerable amusement, because the relatively warm and noisy environments within plants should be hostile to quantum behavior. However, a colleague sent to investigate these claims confirmed that the reports were accurate. Quantum coherence was key for transferring captured photon energy through such a relatively warm but highly organized interior of the leaf. Marais et al. (2018) more recently presented a current overview of how energy transport processes, such as photosynthesis and enzyme catalysis, exhibit quantum mechanical properties, citing preliminary theories and data supporting quantum properties associated with aviary migration, olfaction, and cognition. Indeed, the emerging field of quantum biology suggests that quantum context dependency is likely an important consideration for biological systems.

4.2. The Problem of Consciousness

In the quote above, Carroll (2017) perhaps used the phrase "psychic powers" in a pejorative sense; such a phrase appearing in a book primarily about physics could conjure for many associations with the supernatural or fortune tellers. But we might instead note that the psi claims on the table for discussion involve *consciousness*, which remains poorly understood. We apparently are very far from anything like a consensus theory explaining consciousness. The difficulty of fitting consciousness

within our current theories appears paramount, primarily because nothing in the theories on physics and chemistry we currently have hints at anything regarding phenomenal properties.

Recently, Frankish (2016) argued that the difficulty of fitting consciousness within our currently established scientific understanding justifies questioning the notion of genuine phenomenal experiences altogether. Illusionists such as Frankish have maintained that our experiences are not truly phenomenal, but instead only quasi-phenomenal states that can be reconciled within a completely functionalist framework. Alternatively, if we are realistic about our phenomenal experiences, then Frankish (and others) might argue that we must face up to the idea that consciousness is truly anomalous with respect to our current theories. However, if accepting realism on the phenomenal nature of consciousness requires us to consider consciousness as anomalous, then the case for rejecting the psi data due to its anomalous nature is weakened.

In a recent paper, Carroll (2022) argued, as he had previously against the possibility of psi, that state-of-the-art quantum field theory rules out the possibility that consciousness may be fundamental. Carroll insisted rather that consciousness is likely weakly emergent from complex systems of non-conscious particles. However, Carroll did not present or cite any such theory that would support such a claim.

Overall, I believe there is little justification for applying constraints or limiting principles from aspects of the world for which we have a strong understanding to other aspects where our understanding is considerably weaker. Causality may be better understood in dispositional terms in areas such as biology, psychology, and, arguably, quantum physics. Additionally, where quantum behavior is applicable, quantum context dependency suggests that causal behavior is not well-described in terms of fixed or universal laws.

But that said, perhaps the use of something like basic limiting principles is reasonable in areas of inquiry where we can be confident are fully characterized by classical physics. And perhaps even in areas on the scientific frontier their use can justify constructing low priors within a Bayesian context, provided care is taken to ensure that such priors are not insensitive to accumulating evidence. But when all is said and done, we do not have strong justification for using limiting principles as we've discussed to reject the extant psi data.

5. Fraud and Questionable Research Practices in the Laboratory

I have tried to show that Hume's arguments in his *Enquiry* (including his chapter *Of Miracles*) do not provide the resources for skeptics to dismiss the psi data. That said, the data remain surprising and unpalatable for many, who might well consider that fraud and questionable research practices remain a likely explanation of the results. It must be admitted that evidence of fraud and questionable research practices exists in most (if not all) fields and thus cannot be ruled out here as well. Could some combination of fraud and questionable research methods provide a plausible explanation for the entire extant data?

5.1. Fraud in Psi Research

Roe (2018) reviewed the history of fraud in psi research and found two genuine cases involving "calculated and systematic fraud by the experimenter." One case involved Walter J. Levy, Jr., who had been appointed Director of J. B. Rhine's Institute of Parapsychology in 1974. Levy focused on the psi powers of animals, including chicken embryos. However, three researchers on Levy's team, who had noticed suspicious activity, installed a secret hidden output, which revealed random output that did not support Levy's reported claims. Levy confessed when confronted with the divergence between his results and the hidden output and was forced to resign. He left the field and turned to practicing medicine. Based on this one confirmed incident of fraud, Rhine alerted other researchers in the field to view all of Levy's previous research with suspicion.

The second case of fraud implicated the experimental studies of S. G. Soal, who explored forced choice testing in the UK. Suspicions were raised after a test subject confided to one of Soal's co-experimenters that she had seen him altering figures on a scoresheet. While no signs of physical alterations could be found, fraud was ultimately demonstrated through statistical and computer analysis that revealed the falsification of experimental data.

Of course, no evidence of fraud has been presented regarding the meta-analyses presented in the above table. Thus, dismissing this entire work based on the presumption of fraud or questionable practices is an arguably extreme and unscientific step, even while acknowledging that no field in science or the social sciences is uncontaminated by fraud. Excluding otherwise valid data because of such incidences would wipe whole areas of important research findings. Indeed, most scientific inquiry could conceivably grind to a standstill. We must find a way to assess the likelihood of fraud and

other questionable research practices without eliminating or invalidating otherwise responsible undertakings.

These instances of fraud have been frequently cited by psi critics and have arguably cast a shadow on the field. While fraud has been uncovered in other fields, in those cases generally only the guilty have been penalized, not other researchers uninvolved with the fraud. But the increased skepticism and scrutiny against psi research have plausibly led to higher levels of quality and more rigorous research, relative to non-psi research. For example, Sheldrake (1998) surveyed a wide range of psi experiments published in physical, biological, medical, and psychological journals, revealing that double-blind design, a standard protection for experimental bias frequently used in parapsychological studies, was rarely used. Moreover, Cardeña (2018) cited a number of studies that found psi effects did not diminish as a result of variables representing quality.

The increased scrutiny on psi research, relative to more conventional research, has led to different standards and practices in that research today that arguably assist in withstanding that scrutiny. For example, parapsychology journals have adopted the practice of accepting studies that produce no significant results, with the intention of reducing the file drawer effect.[8] Parapsychologists have also relied more on meta-analysis in pressing their cases, while more conventional studies have a greater tendency to get by on much less. Of course, meta-analysis is more necessary in psi research, not only due to its controversial nature, but also because the relatively low power of the data requires a larger sample size. There are challenges that meta-analysis brings, such as the heterogeneous nature of many studies. However, by testing for significance by combining a relatively large number of studies, psi research has been able to address the question of replication.

Chevassus-Au-Louis (2019), having recently reviewed the evidence on scientific fraud, noted that it is indeed a growing problem in scientific research, particularly in the biomedical fields. He found two especially important contributing factors: the prospect of job placement and academic prestige.[9] With the former, researchers who desire advancement or secure a position are under pressure to publish in a suitable journal (which usually prefers interesting or significant findings) or produce findings that please superiors. Studies have found that such conditions are correlated with fraud. Publication in relatively highly ranked journals, which often prioritize papers that demonstrate new findings, is generally a prerequisite for obtaining more prestigious academic positions.

But such rewards are mostly unavailable for psi researchers. Historically, most psi research has been conducted outside of universities, and no one views psi research, no matter the findings, as giving

anyone an advantage in securing an academic position, much less a prestigious one (Hess, 1992). Furthermore, until recently, most prestigious journals have refused to publish research in parapsychology. It appears that some of the important incentives that contribute to fraud are absent in psi research.

5.2. A Closer Look at Ganzfield Research

While we can't rule out mischief in psi research, there is reason to believe its existence is less than in more conventional fields, because: (1) the expected benefit from fraud is arguably less, and (2) there are increases in scrutiny due to increased skepticism. However, I shall take a brief look at a specific line of research in psi that provides some important details and historical context. Because of space limitations, I shall focus on one design which is one of the most widely researched and consistently supportive experimental method: the ganzfeld telepathy research program. The ganzfeld method was an attempt to employ a "noise reduction" model, based around the idea that sensory deprivation might heighten areas of consciousness more sensitive to psi. This protocol was developed as a mild altered state by inhibiting external stimulus; that is, ping-pong balls were placed over the eyes, and light static noise filled the ears.

The ganzfeld method for studying telepathy is also important because much of its methodology has been influenced through collaboration between Charles Honorton, a psi advocate, and Ray Hyman, a skeptic. After debating the overall results of 28 ganzfeld studies, Honorton and Hyman agreed to collaborate and generate a set of experimental protocols designed to alleviate the potential flaws identified in the previous collection of studies (Honorton and Hyman, 1986). These protocols, which included eliminating sources of sensory linkage and the automation of selection of images shown to the sender, were designed to enhance the quality of the experiment and eliminate design flaws. Cardeña (2018) reported that the 108 studies based on the protocols established by Honorton and Hyman produced a significant psi effect, with $p < 0.10^{-16.10}$ A few additional findings included stability in the hit rate (approximately 30%) across several groupings of the data across time, and a mild correlation between effect size and quality of experimental design.

The possibility that the ganzfeld telepathy findings can be explained by some combination of fraud and questionable practices was taken up by Bierman, Spottiswood, and Biji (2016). These authors based their exploration on the results of John, Loewenstein, and Prelec (2012), which surveyed 2000 psychologists for possible questionable research practices (QRPs). However, Bierman et al. did not rely

on any data regarding questionable practices among psi researchers. They assumed approximately that the same levels of fraud and questionable practices that were obtained from the survey results of John and his colleagues, based on more conventional research, applied to ganzfeld research as well. The history of the ganzfeld research, which involved careful debate on the protocols as well as the data, suggests this to be questionable assumption. Moreover, as noted above, we have reason to believe that psi researchers are likely to have different incentives for undertaking their research (given that academic prestige and government funding are generally off the table). Taking psi researchers as maintaining the same quality of practices as conventional researchers without evidence appears to be a questionable assumption.

That said, even incorporating such questionable levels of QRPs and fraud in their simulation nevertheless fails to account for the ganzfield findings. While the overall *p*-value declines, they report that it remains significant at 0.005. Thus, Bierman and his colleagues aggressively throw nearly everything they can imagine at the ganzfeld data, and yet still find that the data cannot be explained through some combination of fraud and questionable practices.

Let us turn to the findings summarized in the above table. Here we have numerous studies representing hundreds of experiments conducted over decades on diverse modes of psi. Are we willing to accept the possibility that the primary researchers conducted fraud, along with at least questionable practices spread throughout a large portion of studies replicating their effects? Recall that our knowledge of the two known cases of fraud in psi depended on colleagues of the offender having monitored them closely. This is a detail that psi critics often fail to mention when they cite these cases. This history suggests that, while fraud cannot be ruled out, practices of monitoring between researchers considerably increases the difficulty of fraud or possible coordination of fraud. This practice within the psi research community to be on guard against possible fraud has been acknowledged by psi critic Hoebens (from Hovelmann & Michels (Eds.), 2017):

> ... while most parapsychologists accept "psi" as real or very probably real, others have dissented without their dissent leading to excommunication. Some of the very best "debunking" of parapsychology or major aspects thereof have been published by "insiders." ... In recent years, the parapsychological community has formed an increasingly effective internal "police force," and fraud is discussed more candidly than presumably is the case in any other science or proto-science. Recently, I had the privilege of being invited to act as an informal counselor to a parapsychological ad hoc

> committee investigating serious charges of fraud against a prominent investigator. No details of this case may yet be published, but I was impressed by the parapsychologists' determination to get at the truth of the matter. (p. 162)

Recall Hume's well cited claim "That no testimony is sufficient to establish a miracle, unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavors to establish..." (p. 83). Again, Hume is concerned about the testimony of religious miracles, not surprising or anomalous outcomes in lab environments. That said, should we wish to apply the argument to the psi data presented in the table above, we would need to consider the likelihood of factors that would make the data false. Previously, I have argued that claims that the psi data must violate laws of nature do not have a strong basis, especially if one is sympathetic to Hume's view of causality. And if we think that some combination of fraud and QRPs is unlikely to account for the data, as I have argued, we are left to consider that the psi data could be pointing to something anomalous with respect to our current theoretical understanding. Given that anomalies have an important place in scientific history, it is reasonable to anticipate that we will encounter additional anomalous findings, especially where we face persistent gaps in our scientific theories. Consciousness and quantum mechanics remain two areas that we continue to struggle to fully explain. As it happens, aspects of the psi data do fall into these two domains. Therefore, the greater likelihood, in my view, is that the psi data suggest something real that does not fit within our current understanding and merits further attention.

6. Paradigms and Hume's Consideration of the Role of Custom

A key element of Hume's *Enquiry* that has been missing from the debate around psi involves his arguments on the role of custom and habitual thinking for our understanding of the world. Hume claimed that the gaps that persist between our own beliefs and the world's true causal nature (whatever that might be) cannot be overcome through reason and experience. Indeed, Hume indicated that we respond to such gaps in knowledge through our mind's tendency to simply associate a cause to the effect in the context of many repetitions. In this way, our understanding of the world's causal relations is constructed from the various regularities we observe, which are, in turn, enmeshed with habitual associations, reinforced through various kinds of sentiments or feelings.

This notion of an incomplete view of causality, inextricably linked to custom and habits of mind, arguably suggests a rather pessimistic take on our ability to establish what Hume calls "matters of

fact." But Hume does not appear to be very pessimistic. He argues that our natural tendency to forge associative links (which we interpret to be causal) for various kinds of events following others turns out to be a necessary and practical guide to navigating our lives.

> ... this operation of the mind, by which we infer like effects from like causes, and vice versa, is so essential to the subsistence of all human creatures, it is not probable, that it could be trusted to the fallacious deductions of our reason, which is slow in its operations. ... As nature has taught us the use of our limbs, without giving us the knowledge of the muscles and nerves, by which they are actuated; so has she implanted in us an instinct, which carries forward the thought in a correspondent course to that which she has established among external objects; though we are ignorant of those powers and forces, on which this regular course and succession of objects totally depends. (p. 40)

Hume thus reasons that it is not necessary for us to have knowledge of the underlying powers and forces that govern our world; how the mind fruitfully links through associations from the regular succession of the behavior of external objects is sufficient. As Millican (2007) puts it: "Custom provides an answer to the skeptical doubts that Hume has raised not by addressing them, but by ignoring them" (p. xxxix).

While we can never access the true causal nature of the world, the beliefs we gain that are embedded within habitual thinking or custom perhaps provide sufficient understanding for handling our affairs. Thus, I can more or less predict that, when I press the gas pedal in my vehicle, my car will accelerate. I do not need to know anything about my vehicle's internal combustion to successfully drive the car. Moreover, while the regularity connecting gas pedal to acceleration may not always hold (due to mechanical failure or being out of gas), it generally holds well enough for me to drive my car as the need arises. And so our engagement with the world, which involves feedback from probing through actions and observations, ultimately gives us an understanding that falls short of a true understanding of causal relations, which we never observe directly, but is perhaps sufficient to navigate our world successfully.

We can note, however, that such an analysis of the role of custom and habit generally takes place in the context of our immediate environment, where we have direct interaction with objects local and familiar to us. Under these circumstances, where we engage with our world through feedback,

erroneous thinking is held in check, at least to some degree. Perhaps the case is clearer under laboratory conditions or other environments where we can carefully repeat experiments, controlling the influence of various factors. But what about matters far from our observation, where we instead must rely on someone else's expertise, the power of authority, or (in our modern world) various forms of media?

6.1. Revisiting Hume's Miracle Argument

Hume explored this latter problem in the context of testimony on religious miracles. In that case, Hume noted that sentiments such as awe and wonder play a central role in making accounts of religious miracles considerably less reliable than sober and numerous accounts that did not include such miracles. Although he does not explicitly make the case, his arguments also imply that stories inciting wonder and passion across many credulous followers might be useful for those seeking power and influence within religious organizations. Thus, such cases provide ample incentive to mischaracterize the facts. Note that understanding his miracles argument in the context of his *Enquiry* helps to clarify his larger argument on how our beliefs hinge crucially on habitual thinking mixed with sentiment.

I believe we might extend Hume's argument here, based on recent research in social identity theory. This literature has revealed the ease with which groups based on different social identities become hostile to one another (Sherif et al., 1988; Taijfel et al., 1972). Social identity theory can explain why groups may embrace some religious beliefs, even conspiracy theories, to establish links within their social group (Benabou & Tirole, 2011). That is, members sharing a particular group identity may embrace some beliefs, not because they are grounded in fact, but to strengthen their social bonds to the group, which they value. Hume would likely view such social bonds, which have the effect of reinforcing religious beliefs, as another manifestation of sentiment.

6.2. A More Institutional View of Science

I submit that Hume did not exhaust the implications of how our beliefs, emerging from habitual thought and linked with sentiment, might stray from understanding the world's true nature. Hume arguably paved the way for an institutional understanding of scientific practices, which in our present day is primarily framed by Kuhn and his book, *The Structure of Scientific Revolutions* (2012). A core idea from Kuhn is that "normal science" can be understood as guided and constrained by a disciplinary

matrix (paradigm) that consists of a collection of key theories, methods of testing, values, and metaphysical assumptions. Judging the quality of a theory involves comparisons of a paradigmatic theory or methodology, rather than permanent, theory-independent rules. Kuhn also noted that research on anomalies or experimental findings that did not fit into the current paradigm were not encouraged. For Kuhn, this institutional feature had the advantage of encouraging coordination, organization, and efficiency across many scientific disciplines. Of course, in Kuhn's framework, the accumulation or persistence of anomalies would eventually lead to the paradigm becoming untenable.

I submit that Kuhn's characterization of opposing paradigms appears applicable to the current debate between psi researchers and critics. Recalling earlier examples of the difficulty that psi skeptics have had with engaging with the data suggests Kuhn's notion of "incommensurability," the tendency for members of different paradigms to talk past each other. Incommensurability appears to accurately characterize the discourse between psi researchers and psi skeptics. I suggest that, with respect to Kuhn's disciplinary matrix, the different metaphysical assumptions between psi researchers and psi skeptics are especially salient. At the risk of being too simplistic, I propose that a key difference between the two is that psi skeptics are loathe to tolerate any deviations from strictly physicalist (or materialistic) frameworks, whereas psi researchers are prepared to relax that assumption.[11] Since these different metaphysical assumptions involve fundamental views of the world, they can arguably be linked (depending on the case) with beliefs of a religious nature. And such fundamental views, possibly of a religious nature, may well involve strong feelings, or *sentiment*, in Hume's terminology.

Some psi skeptics have argued that psi researchers are motivated through their religious beliefs (Flew, 1985, p.530). However, the problem of sentiment attached to metaphysical beliefs cuts both ways. Tart (1992) and Cardeña (2015) have both characterized this hostility toward the psi evidence with a level of emotionality that is difficult to explain solely through intellectual disagreement on the evidence. And I note that the psi critics discussed here have been selective in their reading of Hume, focusing on the portion of his Enquiry most hostile to religious beliefs, while paying little attention to the other (non-religious) sections that arguably deflate their strong claims concerning "laws of nature."

But that said, we can note that many of the most influential philosophers who have criticized physicalist assumptions, such as David Chalmers and Thomas Nagel, have declared themselves atheist or agnostic with respect to religion. Currently, one of the most attractive frameworks for those seeking alternatives to physicalism is associated with work from Bertrand Russell, hardly a friend to religion.[12] We can also note that none of the data Cardena (2018) summarizes refers to any religious

beliefs. In this debate, perhaps we might consider removing as relevant whatever fundamental beliefs people happen to have and focus on the data.

Overall, the debate around psi appears to be an interesting case to illustrate how habitual thought and various kinds of emotional sentiment might play a significant role in supporting Kuhn's notions of different paradigms. Perhaps Hume's more phenomenological arguments can provide some filling for Kuhn's institutional nature of science. Linking Hume and Kuhn warrants a more in-depth look than space allows here.

7. Conclusion

My central claim here is that Hume's *Enquiry*, which includes his chapter "On Miracles," does not offer the resources to dismiss the research on psi. My reading of the critics of the psi data suggests that they miss that Hume was skeptical, not just of religious miracles, but of our ability to access and characterize the causal relationships in our world. I have also highlighted the problem with establishing limiting or constraining principles derived from a particluar area of inquiry that are then, in turn, applied against another. Hume's arguments aside, I would suggest that extreme care should be taken in making such general characterizations, especially where context plays a substantial role.

While I do not propose that one is compelled to accept the anomalous psi data, I have argued here that it is unlikely that the various meta-analyses produced to-date on several categories of psi could be the product of some combination of fraud and questionable research practices. I therefore argue that it would be fruitful to seriously consider what the psi data might be revealing about our world, particularly in the area of consciousness.

However, I have also noted that the arguments found in Hume's *Enquiry* do help shed light on the current discourse (or lack thereof) between those performing psi research and their skeptics. That is, Hume's arguments on the pivotal role of habitual thinking and sentiment in our understanding is consistent with Kuhn's theory of different paradigms, and how groups associated with each might fail to communicate productively. Arguably, one of the great values of Hume's *Enquiry* is to encourage greater caution, if not skepticism, in how we proceed to view the causal nature of the world, as well as promote greater awareness of the sorts of habitual and emotional thinking that might hinder our progress.

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Footnotes

[1] Cardeña (2018) and other parapsychologists prefer the term *anomalous cognition* to refer to such psi categories as telepathy, clairvoyance, and precognition, which involve accessing information in ways that do not fit with most current scientific theories. He used the term *anomalous perturbation* to refer to the "ostensible influence of intention on non-observable systems, evaluated statistically" (p. 8).

[2] Hyman (2015) makes a similar argument based on the statistical nature of the psi evidence, but does not link it with Hume's position.

[3] The forced choice card experiments, conducted in 1937, are the earliest psi studies included in Cardeña's summaries.

[4] Price (1955) and Flew (1995) argued that any clash between the psi data and Broad's BLTs should be flagged as a violation of the laws of nature, in the same way that Hume argued against religious miracles.

[5] Wagenmakers (2011) criticized Bem's (2011) *Feel the Future* paper on precognition via a Bayesian framework and constructing a very small prior probability, which he justified, in part, on the lack of a specified causal mechanism.

[6] In an interview, Carroll acknowledged that his confidence in this claim was sufficient that he did not believe it was necessary or fruitful for him to examine the evidence of psi (Broderick & Goertzel, 2015).

[7] While many hold the view that Hume resisted any notion of causality beyond regularity, I am sympathetic to Strawson's (2014) view that Hume accepted underlying causal powers that we cannot access and therefore cannot characterize.

[8] The file drawer effect, otherwise known as publication bias, results from the tendency of studies finding a novel, significant effect being more likely to be published than studies that find no significant effect. Hence, meta-analysis that does not include studies consigned to the file drawers may report a significant effect that would not be supported if all studies had been included.

[9] Obviously, in many cases these two are bundled together.

[10] Cardeña (2018) adapted this finding from Storm et al. (2010).

[11] Recently, psi researchers have explored explanations that depart from physicalist versions of consciousness or build on selected interpretations of quantum mechanics. Williams (2019) has

developed a framework, consistent with a wide range of psi data, that attempts to make progress on the "hard problem of consciousness." Radin and Kauffman (2022) have argued that the psi is consistent with an interpretation from quantum mechanics where consciousness triggers wave function collapse.

[12] For a thorough investigation of Russellian monism from different perspectives, see Alter and Nagasawa (2015).

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