Mystery, Explanation, and Credence

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Abstract How should the information that a proposition \( p \) is a mystery impact your credence in \( p \)? To answer this question, we first provide a taxonomy of mysteries; then, we develop a test to distinguish two types of mysteries. When faced with mysteries of the first type, rational epistemic agents should lower their credence in \( p \) upon learning that \( p \) is a mystery. The same information should not impact agents’ credence in \( p \), when they face mysteries of the second type. Our account of mystery complements existing explications of abduction. We illustrate its significance by examining the mystery of consciousness.

Keywords: Explanation; Confirmation; Unexplainability; Mystery; Credences; Consciousness

1 Introduction

We are surrounded by mysteries. Free-will, intentionality, mental causation, personal identity, and the origin of life: these are some of the phenomena that philosophers have said to be ‘mysteries.’ Several scientific puzzles have been called ‘mysteries’ too. Examples include the asymmetry of matter and antimatter in the observable universe, the evolution of sex, and the existence of conscious experience, which “is at once the most familiar thing in the world and the most mysterious” (Chalmers 1996, 3).

Despite the fact that so many phenomena and events have been called ‘mysteries,’ no attention has been devoted to the questions: What does it mean that something is a mystery? Whence does a mystery derive its mysteriousness? How should the information that something is a mystery impact our credences about that something?

We begin to remedy this situation. After regimenting the question of how mystery should relate to credence (Section 2), we provide a taxonomy of mysteries, and distinguish two types of mysteriousness (Section 3). We then present a test mapping these types into two cases. In the first case, rational epistemic agents ought to lower their degree of credence in a proposition after learning that the proposition is a mystery. In the second case, rational agents ought to leave their credence unchanged (Section 4). We conclude by putting these results into a broader philosophical perspective, illustrating their significance in the light of the “mystery of consciousness” (Section 5).

2 Thinking about mysteries

Suppose that you believe that something is the case with a certain degree of confidence. Let \( p \) be the proposition that you believe, and \( \text{Prob} (p) \) your subjective, probabilistic credence that \( p \) is the case. Suppose that you ask “Why (or how) is it the case that \( p \)?” to a source \( M \), whom you believe to be knowledgeable, reliable, and sincere. \( M \) replies to you that if \( p \) is or were true at all, why (or how) it is the case that \( p \) is a mystery. Thus, \( M \) does not give any direct information about the truth or falsity of \( p \). The only information you receive concerns the mysterious status of \( p \), assuming that \( p \) is true. Let us finally suppose that you believe that if a proposition is a mystery, then \( p \), in some sense, cannot be explained,\(^1\) that is: \( p \) is, in some sense, unexplainable.\(^2\)

\(^1\) Our analysis does not hinge on any particular account of explanation. We assume that all *explanantia* are propositions or sets of propositions. An explanans may describe some law, argument pattern, mathematical
There are several ways in which M’s reply can change your epistemic situation. Your belief about what a mystery is can change; your belief that the source M is knowledgeable, reliable, and sincere can change; your degree of confidence in some shared background theory that is commonly assumed to govern people’s explanatory practice can change; and, lastly, your degree of confidence that p can change.

Here we focus on the question: Should your credence in p change, after you acquire the information that if p, why or how p is a mystery? This question concerns a specific type of evidence that might count against some belief of yours, and matters to the issue of whether explanatory considerations have confirmation-theoretic import or not (e.g., Harman 1965; van Fraassen 1989; Douven 1999; Lipton 2004).

The relation between explanation and confirmation is the focus of the literature on abductive reasoning. Existing explications of abduction focus on the epistemic status of a potentially explanatory hypothesis. They posit that the explanatory success of a hypothesis with respect to an explanandum is part of the evidence that should lead us to raise our credence that the explanatory hypothesis is true (Douven 2011). But no attention has been paid to the complementary question of whether explanatory failure with respect to an explanandum is part of the evidence that should lead us to lower our degree of credence in the explanandum.

In what follows, we take up this neglected issue, and clarify whether and under what conditions it is epistemically rational to revise your credences in such a way that:

$$\text{Prob} \ (p \mid p \text{ is a mystery}) < \text{Prob} \ (p).$$

We begin by distinguishing different senses in which a proposition can be said to be a ‘mystery.’

### 3 A taxonomy of mysteries

In a general sense, which assumes an epistemic conception of explanation, to say that a proposition p is unexplainable is to say that no epistemic agent in our world can ever justifiably believe some other proposition q that offers an adequate explanation for why or how p.

Saying that a proposition is unexplainable is different from saying that the proposition was unexplained or is unexplained. Although the proposition that the tides are higher during a full moon...
was unexplained before Isaac Newton, that proposition was explainable. It was explained when Newton published his *Principia*, which showed that the gravitational laws he provided explain, among other phenomena, the correlation between the behaviour of the tides and the position and phase of sun and moon. So, given some point in time, if a proposition \( p \) does not have an adequate explanation at that time, it does not follow that \( p \) is unexplainable. It simply means that up to that time in history nobody has yet believed any proposition \( q \) that adequately explains why or how \( p \).

If nobody happens, has happened, and will ever happen to believe any proposition \( q \) that offers an adequate explanation of \( p \), then \( p \) may be unexplainable. There are at least three cases to distinguish, and just two concern genuinely unexplainable propositions.

In the first case, nobody has ever believed or will believe some \( q \) that explains \( p \), because nobody has and will ever have the interest, the motivation, the curiosity, or the material and theoretical resources to find out about why \( p \) is the case. The proposition \( p \) is not genuinely unexplainable, since there is some other proposition \( q \) epistemically accessible to creatures like us that explains why \( p \). As a matter of contingent fact, nobody will ever believe \( q \). In this sense, \( p \) will never be adequately explained. But this is not a case of genuine mystery.

In the second case, nobody has believed and will ever believe some proposition \( q \) that adequately explains why \( p \), because every such proposition \( q \) just happens to contingently lie on one side of human cognitive capabilities. All such propositions \( q \) are inaccessible to us, given the cognitive capacities humans happen to have. If \( q \) is inaccessible to the type of epistemic agents humans are, then \( p \) will remain a mystery to us. In this sense, mysteries lie beyond our epistemic reach (Chomsky 1975, Ch. 4).

For example, some have argued that the answer to the question “Why/How do brain processes produce conscious mental states?” is in principle inaccessible to epistemic agents like us, since our cognitive capacities are not fit to answer, or to even comprehend an answer to that question. Hence, to creatures like us, why some mental states are conscious must remain a mystery (McGinn 1991).

The third case of mystery concerns explanations that are epistemically inaccessible because of the nature of the *explananda* they seek to explain. These *explananda* correspond to brute facts that have no explanation, or they correspond to incoherent propositions. For example, there may be no explanation for why the laws of nature have the forms they do. But if there is no explanation \( q \) for some proposition \( p \), then no human agent will be able to find an explanation for \( p \).

More interesting is the case where *explananda* are incoherent with some shared standard of explanatory reasoning, or with some background theory to which one is strongly committed. Standards of explanatory reasoning are employed to discover, learn, use, and reason about explanations. These standards may change over time. What would be regarded as adequate explanation some 300 years ago might be different from what is accepted nowadays or in 50 years. While individuals may vary in the particular explanatory standards they employ, there is a set of minimal standards, which should be shared with interlocutors about the alleged mystery \( p \). These standards plausibly include principles like the law of non-contradiction, and the propositions that nothing comes from nothing and that no event in nature can exceed the productive power of nature.5

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5 St. Thomas Aquinas (*Summa Contra Gentiles*, III) says: “those things are properly called miracles which are done by divine agency beyond the order commonly observed in nature (*praeter ordinem communiter observatum in rebus*).” This characterisation of a miracle is entailed by Hume’s famous definition that a miracle is “a violation of the laws of nature” (Hume 1748/2000). Voltaire (1764/1901, p. 272) provides a
Such standards cohere with background theories like the theories that everything in the actual world is physical, and that every event has a physical cause, assuming it has a cause at all.

So, an *explanandum* is incoherent with some shared standard of explanatory reasoning at least when it corresponds to a proposition that is self-contradictory, or that describes some phenomenon that exceeds the productive power of nature. An *explanandum* is incoherent with shared background theories at least when it corresponds to a proposition that is inconsistent with the idea that every event has a physical cause. If the proposition p is incoherent with some shared standard of explanatory reasoning or background theory, then it cannot be adequately explained given the standard or theory.

4 Mystery and credence
Should your credence in p change after you acquire the new information that *p is a mystery*? Being told that a certain proposition is a mystery can affect your credence in p in two ways: either directly or indirectly. Indirectly, it can undermine your credence in some other proposition relevant to your having the belief that p. For instance, the information that p is a mystery could undermine your credence in some other proposition that concerns the *method* on which you relied to acquire the belief that p. If you acquired the belief that p based upon the testimony of an eyewitness E, then learning that p is a mystery may lower your credence in the proposition that E is a reliable eyewitness. The information that p, if true, is mysterious might also undermine your credence in some other proposition that concerns the *background theories or reasoning standards* that allowed you to acquire the belief that p. The information that it is mysterious why or how dark matter exists in the cosmos may undermine your credence in the laws of gravity established by Newton and Einstein, which allowed you to infer the existence of dark matter.

Apart from affecting your credence in some other proposition relevant to your having the belief that p, the information that p is a mystery can affect your credence in p directly, independently of the way in which you acquired p or of any other proposition indirectly related to your credence in p. In the following analysis, we focus on the second case only, which we take to be fundamental.

4.1 (A)Symmetries in unexplainability
There is a simple test that distinguishes two types of unexplainability. Recall that the reliable, knowledgeable, and sincere source M informs you about the mysterious status of p while remaining silent about the truth value of p. The information you receive is that:

(a) If p is true, then why or how p is a mystery.

Since p is assumed to be a proposition, we can form its negation not-p and we could equally inquire about that negation. The question could be asked “Why or how is it that not-p?” M could give you this answer:

(b) If not-p is true, then why or how not-p is a mystery.

Depending on the content of p, there may or may not be a connection between the statements (a) and (b) as asserted by M.

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stronger definition of a miracle as “the violation of mathematical, divine, immutable, eternal laws. By the very exposition itself, a miracle is a contradiction in terms: a law cannot at the same time be immutable and violated.”
To illustrate, consider a mathematical proposition such as Goldbach’s conjecture, which is yet unexplained. Assume that you are told that the conjecture is mysterious. No human epistemic agent will, due to certain limitations, ever be able to find a mathematical proof for the proposition p expressed by this conjecture. Assume that you are also told that the converse of Goldbach’s conjecture is a mystery. Nobody will ever be able to find a counterexample to said conjecture. Yet, Goldbach’s conjecture has a definite truth value: it is either true or false, but not both. Therefore, in this case, there is a certain symmetry in unexplainability. Therefore, in this case, a knowledgeable, reliable and sincere source should be prepared to assert both (a) and (b). Similarly, the question why there is more landmass on the northern hemisphere than on the southern would constitute a symmetric mystery.

For the other extreme, consider some other proposition such as the proposition that Jesus materially turned water into wine at the marriage of Cana. Not only all knowledgeable chemists, but also most lay people will subscribe to the statement that “If it is true that Jesus transformed water into wine at the marriage of Cana, then that is a mystery.” However, few people would be prepared to support the corresponding assertion (b), that “If it is not true that Jesus transformed water into wine, then why or how so is a mystery.” The content of p is such that there is an asymmetry between (a) and (b). If p is true, then why or how so is a mystery. But if not-p is true, then why or how so is not a mystery, since it coheres with a shared standard of explanatory reasoning like the principle that no event in nature can exceed the productive power of nature. So, here the source should be prepared to assert (a) but not (b).

Hence, the question “If not-p were true, would not-p be a mystery?” allows us to distinguish between two classes of mysteries: symmetric mysteries, where both p and not-p, if true, would be mysterious, and asymmetric mysteries, where not-p, if true, would not constitute a mystery.

These two classes map to the distinction between the two types of unexplainability we identified above. Limitations of humans’ cognitive capacities do not hinge on the truth value of p; they do not create an asymmetry between (a) and (b). Instead, when the unexplainability of a proposition depends on the logical form of the proposition itself, or on the logical or evidential relations between the proposition and some shared explanatory standard, there will be an asymmetry between (a) and (b).

4.2. How should mysteries impact your credences?

The symmetric-asymmetric distinction is relevant to addressing how you should update your credence in p after learning that p is a mystery. We stipulate that a rational agent’s credence function Prob(·) satisfies the axioms of probability, and that belief update is carried out via Bayesian conditionalization. Hence, the probabilities of mutually exclusive events should sum up to at most one, and impossible events should receive a probability of zero.

Let us denote the set of relevant standards of explanatory reasoning or background theories by S, where S is a conjunction of many, possibly interrelated, individual propositions. The information that “If p is true, then why or how p is a mystery” conveys the information that p and S are mutually incompatible, or at least, that p is very unlikely given S. By the laws of probability, the

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6 Being a statement about individual natural numbers, the Goldbach conjecture is not independent of ZFC, it does have a definite truth value. Goedel’s completeness theorem then implies that there also is a proof or a counterexample to the Goldbach conjecture in classical mathematics.
agent should revise her credences in light of this information, in such a way that this impossible event gets assigned a probability of zero,\(^7\) that is:

\[
\text{Prob} \ (p \& S| \ p \ is \ a \ mystery) = 0
\]

Where \(\text{Prob} \ (x| \ p \ is \ a \ mystery)\) stands for the probability of \(x\) after revising with the new information that \(p\), if true, is mysterious. By the same argument, the revision will have to ensure that the probabilities of \(p\) and \(S\) sum up to at most one, since both events are mutually exclusive:

\[
\text{Prob} \ (p \ | \ p \ is \ a \ mystery) + \text{Prob} \ (S \ | \ p \ is \ a \ mystery) \leq 1.
\]

Now, let us turn our attention to your prior credences. First, prior of being informed about the mysteriousness of \(p\), you should have a high degree of credence in \(S\), since these form the set of background standards deeply engrained in processes of explanatory reasoning. Secondly, your prior credence in \(p\) should be sufficiently high to make you inquire about the truth value of \(p\). These two assumptions together imply that your prior credences are such that

\[
\text{Prob} \ (p) + \text{Prob} \ (S) > 1
\]

One way to see why this should hold is through a threshold theory of belief. If \(t\) is a fixed threshold for converting probabilistic credences into belief simpliciter, then there is some \(t\) such that you believe \(x\) (simpliciter) if and only if \(\text{Prob}(x) > t\).\(^8\) Assume that you believe (simpliciter) in your background theory \(S\), that is: \(\text{Prob}(S) > t\). Now, assume for a contradiction that \(\text{Prob}(S) + \text{Prob}(p) \leq 1\). Since \(\text{Prob}(S) > t\), it follows that \(\text{Prob}(p) < 1-t\) and that \(\text{Prob} \ (\text{not}-p) > t\). So, the agent believes (simpliciter) that not-\(p\).

This result shows that the sum of \(\text{Prob}(S)\) and \(\text{Prob}(p)\) can only be smaller or equal to 1 if you disbelieve that \(p\). In all other cases, in particular when suspending judgment about \(p\), the sum \(\text{Prob}(S) + \text{Prob}(p)\) will be strictly larger than 1. Stipulating that you will not inquire “Why or how can it be that \(p\)?” to a knowledgeable, reliable, and sincere source if you already disbelieve that \(p\), the assumption is justified that:

\[
\text{Prob} \ (p) + \text{Prob} \ (S) > 1.
\]

Thus, learning that \(p\) and \(S\) are mutually incompatible (or that \(p\) is very unlikely given \(S\)) should lead an epistemically rational agent to revise her degrees of credence to ensure that:

\[
\text{Prob} \ (p \ | \ p \ is \ a \ mystery) + \text{Prob} \ (S \ | \ p \ is \ a \ mystery) \leq 1
\]

Such revision can be done by reducing your credence in \(S\), the credence in \(p\), or both.

In most situations, this revision will not be done by exclusively reducing the credence in \(S\), while leaving the credence in \(p\) constant. If your confidence, or “firmness in belief” (Skyrms 1980) that \(p\) is sufficiently high, then the information that \(p\) is a mystery provides you with one reason to lower your credence in \(S\). However, given that some shared standards of explanatory reasoning are deeply engrained in our epistemic practices, not all weight of the revision should be borne by your background theory \(S\). At least some part of the revision should be borne by you revising your credence in \(p\), which justifies that:

\[
\text{Prob} \ (p \ | \ p \ is \ a \ mystery) < \text{Prob} \ (p)
\]

\(^7\) For simplicity, we focus on the case where \(p\) and \(S\) are incompatible. Where \(p\) is merely highly improbable given \(S\) (i.e., \(\text{Prob} \ (p|S \ & \ p \ is \ a \ mystery) \approx 0\)), the analysis is similar. By Bayes’s theorem, we have that \(\text{Prob} \ (p \ | \ S \ & \ p \ is \ a \ mystery) \approx \frac{\text{Prob}(p \ & S| p \ is \ a \ mystery)}{\text{Prob}(S|p \ is \ a \ mystery)}\). Since the denominator of the right hand side is smaller than one, the left side can only be close to zero if also the nominator of the right side is. The revision has then to ensure at least that \(\text{Prob} \ (p \ & S| p \ is \ a \ mystery) \approx 0\).

\(^8\) The existence of such a threshold follows, e.g., from the Lockean Thesis of belief (see e.g. Leitgeb 2014).
Indeed, most belief revision policies satisfy this property. Let us illustrate this with one particular belief revision policy, that is: normalization. This policy prescribes that the weights of revision should be borne equally by $\text{Prob}(p)$ and $\text{Prob}(S)$:

$$\text{Prob}(p \mid p \text{ is a mystery}) = \frac{\text{Prob}(p)}{\text{Prob}(p) + \text{Prob}(S)}$$

and likewise for S. Since the denominator of the right side, $\text{Prob}(p) + \text{Prob}(S)$, is larger than 1, it follows that $\text{Prob}(p \mid p \text{ is a mystery}) < \text{Prob}(p)$. Normalization prescribes to lower your credence in $p$ upon learning that $p$ is a mystery. So, when the relevant unexplainability concerns a proposition incoherent with shared, engrained standards of explanatory reasoning, it is epistemically rational for an agent to lower her degree of credence that $p$, upon receiving the new information that $p$ is unexplainable.

The reason why this ought to be so is illuminated by the asymmetry in the pattern of responses that the source M should give to the questions of “Why/how $p$?” vs. “Why/how not-$p$?” The source M should be prepared to assert (a) but not (b), upon your request for explanations. This asymmetry in responses will, by uncovering a conflict between $p$ and some background reasoning standards, provide you with evidence bearing on the truth value of $p$, which should lead you to revise your credence that $p$.

Where mystery is symmetric, both $p$ and not-$p$ would be mysterious. Here the mysteriousness of $p$ and not-$p$ is due to the epistemic inaccessibility of the subject matter of $p$, which depends on limitations in our cognitive make up. In this case, your source’s pattern of responses does not obviously provide new evidence about the truth value of $p$.¹

To illustrate the point, consider two explananda such as Goldbach’s conjecture and the proposition that consciousness arises purely from brain activity. The explanandum proposition in these two cases is neither self-contradictory, nor is it obviously incoherent with some other shared standard of explanation. In particular, when the mysteriousness of a proposition $p$ depends on theoretical, practical or cognitive limitations, not-$p$ would be equally mysterious. For it would be as an epistemically hard a task to find an explanation of why or how $p$ holds—if $p$ is true—as to find an explanation for why or how not-$p$ holds—if $p$ is not true. Both explanations would be equally epistemically inaccessible to us. Due to this symmetry, the information that $p$, if true, is a mystery is irrelevant to the truth value of $p$. If the mysteriousness of $p$ is irrelevant to its truth, you will not have any reason to revise your prior credence that $p$.

5 The mystery of consciousness

This paper has addressed three questions: What does it mean that something is a mystery? Whence does a mystery derive its mysteriousness? How should the information that something is a mystery impact our credences about that something? We analysed mystery in terms of unexplainability, and explained how the answer to the third question depends on the content of $p$.

If $p$ is self-contradictory or inconsistent with some shared standard of explanatory reasoning, then not-$p$ should not be equally mysterious. Given this asymmetry, and given that the relevant, shared standards of explanatory reasoning are sufficiently engrained in our epistemic practice, we

¹ We emphasize that we focus on revising the credence in $p$ directly. Of course, the information that $p$ and not $p$, if true, were mysterious might undermine your belief in, say, the method you used to acquire the belief in $p$. You might then prefer to revise your belief in the adequacy of this method and, possibly, move to a less opinionated judgment on $p$. 
argued that a rational epistemic agent ought to lower her degree of credence that p, upon receiving the new information that p is unexplainable. If p is not self-contradictory or inconsistent with some shared standard of explanatory reasoning, then not-p should be equally mysterious. Given this symmetry, the new information that p is a mystery does not bear on p’s truth value. Under this circumstance, it will generally be epistemically rational for an agent to keep unchanged her degree of credence in p.

Our contributions are therefore twofold: we offered a taxonomy of mysteries in terms of the notion of unexplainability, and we identified under which circumstances the unexplainability of a proposition has confirmation-theoretic import. We conclude by clarifying how these results matter to several ongoing debates in philosophy and science.

The question addressed by this paper is closely related to issues surrounding the nature and rationality of abduction (aka inference to the best explanation), which assigns a special confirmation-theoretic import to explanatory considerations. In the last decades, the debate has focused on whether explanatory success is a (defeasible) mark of truth (Harman 1965; Van Fraassen 1989; Lipton 2004). No attention has instead been paid to the related questions of whether and under which conditions explanatory failure is a (defeasible) mark of falsehood.

Our analysis addressed these questions in the light of a novel taxonomy of mystery as unexplainability, thereby complementing existing literature about the connection between explanatory power and truth. If we are right, then there should also be a connection between persistent explanatory failure and falsehood. Specifically, we should sometimes lower our credence in propositions that we know present a certain kind of unexplainability.

This result matters to several on-going debates in science and in philosophy. Given the number of phenomena that have been variously characterised as ‘mysterious,’ our taxonomy of mysteries along with our analysis of asymmetric vs. symmetric mysteries should reconfigure our understanding of these debates. The case of consciousness illustrates this point.

McGinn (1991) claims that consciousness is a mystery because we humans are simply not equipped to find an explanation for why or how brain states and activity give rise to conscious experience (see also Chomsky 1975). The point is not that the existence of consciousness would breach accepted standards of explanatory reasoning, neither is the point that consciousness cannot be given a functional characterisation. The point is that we humans lack the conceptual repertoire necessary for explaining the relation between properties of the brain and conscious experience. But if we lack this conceptual repertoire, then both the proposition that there is some neural property N such that N produces conscious experience, and the proposition that there is no neural property N such that N produces conscious experience will remain mysterious. Facts about the link (or lack of) a link between P and consciousness will be epistemically inaccessible to us humans as are facts about the link (or lack of) a link between the property of having a mass and inertia to pigs. We would face a case of symmetric mysteries, where both p and not-p, if true, would remain mysterious to us. If this is right, and because of this kind of epistemic inaccessibility, our prior credence in the proposition that there is some neural property N such that N produces conscious experience should not be affected by the new information that that proposition is mysterious.

Chalmers (1996) situates the mysteriousness of consciousness elsewhere. Consciousness would be a mystery because of its incoherence with widely shared standards that govern our epistemic and explanatory practices. According to Chalmers (1996), consciousness cannot be

10 Strictly speaking, consciousness itself isn’t mysterious in our sense because it’s not a proposition.
explained like any other complex property (e.g., genetic dominance or inflation) in terms of physically realized functional properties, because it cannot be captured in physical or functional terms. The idea is that consciousness depends on non-physical properties. If this is so, then knowing all physical facts would not suffice for knowing everything there is to know about consciousness. Furthermore, since consciousness cannot be reduced to physical properties, it may breach the principle of the causal closure of the physical, according to which every event that has a cause has a physical cause. If this type of incoherence (with functionalism, physicalism, and the causal closure of the world) is the source of mysteriousness for consciousness, then the proposition that there is some neural property N such that N produces conscious experience, and the proposition that there is no neural property N such that N produces conscious experience will not remain equally mysterious. The former but not the latter coheres with shared standards of explanatory reasoning, and we would face an instance of asymmetric mystery. If this is right, then our prior credence in the proposition that there is no neural property N such that N produces conscious experience should be lowered after learning that this proposition is mysterious.

References