Question Dynamics

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Abstract

The paper presents a new scientonomic account of *question dynamics*. To explain the process of question acceptance and rejection, we begin by introducing the notion of *epistemic presupposition* and show how it's different from the notion of *logical presupposition*. With the notion of epistemic presupposition at hand, we formulate *the law of question acceptance*, a new scientonomic axiom, which states that a question becomes accepted only if all of its epistemic presuppositions are accepted, and it is accepted that the question is answerable. We then show how the process of question rejection can be explained by means of *the question rejection theorem*, which states that a question becomes rejected when other elements that are incompatible with the question become accepted. To deduce this theorem in the usual scientonomic fashion (from the first law and the compatibility corollary), we first ascertain that the notion of compatibility/incompatibility is applicable to questions and show that one can legitimately speak of both question-theory and question-question incompatibility. We conclude by providing a quick illustration of the historical applicability of this new framework and suggest a number of questions for future research.

Introduction

Following the acceptance of Rawleigh's modification (Rawleigh, 2018), *questions* were introduced into the scientonomic ontology of epistemic elements. Yet, the *dynamics* of the process of question acceptance and rejection remains unclear: what underlying mechanism leads to questions being accepted or rejected? Classic philosophical literature offers many useful reflections on the process of question change. Ludwik Fleck was among the first to highlight the place of questions in what he calls *thought-styles* and their role in shaping the contents of disciplines (Fleck, 1979). Similarly, Michel Foucault traced how questions change across different *epistemes* and how this leads to the creation and extinction of entire disciplines (Foucault, 2002). Hans-Georg Gadamer emphasized "the *priority of the question* in all knowledge and discourse that really reveals something of an object" (Gadamer, 2004, p. 357). More recently, Nicholas Jardine's *Scenes of Inquiry* provided a great many insights into the process of the "emergence and dissolution of questions" (Jardine, 2000, p. 2). Equally useful is the analysis provided by Nicholas Rescher in his *Inquiry Dynamics* (Rescher, 2000). What we lack at the moment, however, is a systematic scientonomic account of the underlying mechanism of question acceptance and rejection.

In this essay, we aim to fill in this gap by completing the following tasks. First, we will clarify what it means for a question to presuppose a theory by defining the notion of *epistemic presupposition*. Second, we will suggest a *law of question acceptance* as a new scientonomic axiom; we will argue that a question's acceptance crucially depends on the acceptance of its presuppositions as well as the second-order theory that the question is answerable. We will then turn to the process of question rejection and discuss the applicability of the law of scientific inertia and the notion of compatibility to questions. By showing that we can legitimately speak of question-theory as well as question-question compatibility, we will formulate and deduce a theorem concerning the mechanism of *question rejection*. We will conclude this paper with a quick historical illustration and by identifying potential areas of future research.

Questions, Answers, and Presuppositions

To unearth the dynamics of question acceptance and rejection, it is necessary to explore a key relationship between questions and theories – that of questions *presupposing* theories or, conversely, of theories *being presupposed* by questions. It is currently accepted in scientonomy that each theory is an *answer* to a certain question. While not stated explicitly, this relation is implicit in the current scientonomic view. This can be seen, for instance, in the current definition of *theory acceptance*: "a theory is said to be accepted by an epistemic agent if it is taken as the best available answer to its respective question"

(Barseghyan, 2018). It is also implicit in Rawleigh's discussion of questions as well as the Encyclopedia of Scientonomy, where theories are understood as answers to questions (Rawleigh, 2018). In general literature on questions, the notion of *answer* plays a central role. While this is not an opportune place to discuss the typology of answers, it is important for the purposes of this paper to clarify the notion of *direct answer*. Most theorists agree with Belnap and Steel, who state that "a direct answer is a piece of language that completely, but just completely, answers the question" (Belnap & Steel, 1976, p. 3). To clarify what counts as a direct answer to a question, consider the following example:

There seems to be some discrepancy in how the current state of the debates on the typology of answers is portrayed in the literature. For instance, the *Stanford Encyclopedia of Philosophy* article "Questions" authored by Cross and Roelofsen (2018) seems to equate the notion of *answer* with that of *direct answer* and, as a result, makes it sound as though most theorists agree that corrective answers are not answers at all. Perhaps this is a simple wording issue, but such a depiction contrasts with the one provided by one of the leading theorists in the field, Andrzej Wiśniewski (2015). According to Wiśniewski, most scholars would agree that direct answers, or *principal possible answers*, as he calls them, "are not the only possible answers" (Wiśniewski, 2015, p. 275). There are also partial answers, eliminative answers, short answers, and corrective answers. One can agree with Wiśniewski that when it comes to the terminology and taxonomy of answers, "no commonly accepted, unified account has been elaborated yet" (Wiśniewski, 2015, p. 276). The development of such an account might be an important scientonomic project.

What is the distance between the Earth and the sphere of the stars?

- (a) The distance between the Earth and the sphere of the stars is two million miles.
- (b) Two million miles.
- (c) The distance between the Earth and the sphere of the stars is equal to the radius of the sphere of the stars.
- (d) There is no such thing as “the sphere of the stars”.

Most theorists would say that (a) is a direct answer to the question, while (b) and (c) are not direct answers to the question, and (d) is a *corrective answer* to the question. Some theorists, like Boër and Lycan, claim that corrective answers count as answers, while others agree with Belnap and Steel that corrective answers do not count as answers (Boër & Lycan, 1976, pp. 43-44; Lycan, 1986, ch. 4; Wisniewski, 2015, pp. 276, 302-303; Belnap & Steel, 1976, pp. 11-16; Cross & Roelofsen, 2018). In any event, it suffices for our present purposes that most theorists would consider only answers of type (a) as direct answers to their respective questions.

The *answer* relationship is captured in the current scientonomic ontology of epistemic elements, according to which the two basic classes of elements that can undergo scientific change are questions and theories, where *each theory is an attempt to answer a certain question* (Barseghyan, 2018; see also Rawleigh, 2018). Naturally, many theories may attempt to answer the same question. For example, propositions such as “Poor diet causes cancer”, “Smoking causes cancer”, and “Exposure to radiation causes cancer” all answer the same question, “What causes cancer?”. In diagrams, this relationship is depicted by a solid connector line with a solid diamond attached to the question:

As we will show, the notion of *answer* is instrumental in defining another important relationship between questions and theories – that of presupposition. While theories are *answers* to questions, questions themselves *presuppose* theories. In order to shed light on the process of question acceptance and rejection, we should first

investigate what this *presupposition* relationship entails.

According to Belnap and Steel, a question is said to presuppose a certain statement if and only if the truth of the statement is a logically necessary condition for there being a true (i.e., correct) answer to the question (Belnap & Steel, 1976, p. 5; Cross & Roelofsen, 2018). Rescher agrees that “a presupposition of a question is a claim (thesis or contention) that is implicitly inherent in – and therefore entailed by – each and every one of its possible

fully explicit answers” (Rescher, 2000, p. 10). To illustrate this relation, consider the question “What is the distance between the Earth and the sphere of the stars?”. Any conceivable direct answer to this question will

In the scientonomic context, the relationship of questions *presupposing* theories was first discussed in May 2019 by the research team involved in the *Visualizing Worldviews* Scholars-in-Residence project sponsored by Jackman Humanities Institute. Specifically, the eleven members of the research team agreed that a question can presuppose one or many theories and provided diagrammatic tools for visualizing this relation. The diagrammatic notation and some of its applications are presented in Barseghyan, Patton, & Shaw (Eds.), forthcoming.

logically imply such theories as “The Earth exists”, “The sphere of the stars exists”, “There exists a distance between the Earth and the sphere of the stars”, etc. This is illustrated in the diagram below:

Not all answers entail the presuppositions of a question. For instance, one corrective answer to the question “What is the distance between the Earth and the sphere of the stars?” is “There is no sphere of the stars”; the latter clearly doesn't entail the presupposition that the sphere of the stars exists.

Note that this standard notion of presupposition is essentially *logical*, as it concerns exclusively the logical relation between statements, namely that a presupposition to a question is logically implied by any answer to that question. While there are several ways of defining the notion of presupposition, we believe that the following definition borrowed from Rescher (2000, p. 10) captures the gist of the idea:

Logical Presupposition $\equiv$
A theory is said to be a logical presupposition of a question, <i>iff</i> the theory is logically entailed by any direct answer to the question.

This notion of logical presupposition is in tune with the standard usage of the term in the current literature (see for instance, Sober, 1986, p. 144; Wisniewski, 1994, p. 277; Wisniewski, 1995, p. 115).

An alternative formulation is given by Belnap and Steel: “A question, *Q*, presupposes a statement, *A*, if and only if, the truth of *A* is a logically necessary condition for there being some true answer to *Q*” (Belnap & Steel, 1976, p. 5). It is worth exploring how this notion of presupposition is related to that of Rescher.

It is evident that a theory can act as a logical presupposition for many different questions. Take the above example of the Earth and the sphere of stars. Apart from presupposing the question, “What is the distance between the Earth and the sphere of stars?”, the propositions “Earth exists” and “the sphere of the stars exists” can also act as presuppositions for such questions as “What physical similarities do the Earth and sphere of stars share?” and “Does the sphere of stars affect the Earth?”:

For example, it logically follows from any A , that A or B for any arbitrary B . Similarly, any A logically implies not-not- A , not-not-not-not- A , not-not-not-not-not-not- A , etc. (Berto & Jago, 2019, p. 117).

It is also evident that a question can presuppose many theories. But how many presuppositions can a question have, i.e. what are the upper and lower cardinalities of the relationship? Specifically, do questions have a finite

number of presuppositions, or are there cases when a question presupposes an infinite number of logical presuppositions? It is easy to see that the relation of logical presupposition is explosive as it assumes that any question has *infinitely many* presuppositions. Specifically, as Rescher shows, questions can have infinitely many presuppositions in that “every logical consequence of a presupposition is itself a presupposition if only because p entails p -or- q ” (Rescher, 2000, p. 11). Since any theory can have infinitely many logical consequences, this implies that a question can have infinitely many logical presuppositions, which leads to an explosion:

Since the logical notion of presupposition leads to an explosion, we doubt that it can be useful when studying how *finite* epistemic agents come to accept and reject their questions. Thus, another notion of *presupposition* is needed if it is to be useful when describing the dynamics of question change. We believe that an *epistemic* notion of presupposition will serve us better in our quest to decipher the mechanism of question acceptance and rejection:

Epistemic Presupposition ≡
A theory is said to be an epistemic presupposition of a question for some agent, <i>iff</i> the agent accepts that accepting any direct answer to the question will necessitate accepting the theory.

In contrast with the logical notion of presupposition, this epistemic notion assumes that the relation of presupposing is deeply agent-dependent: what can be a presupposition for one agent need not necessarily qualify as a presupposition for another agent. A theory would count as an epistemic presupposition of a certain question for an agent, only if the agent is prepared to accept that theory when they accept an answer to the question, irrespective of what that answer is. Consider, for example an epistemic agent who, when accepting p , nevertheless does not accept p -or- q in order not to clutter their mosaic and avoid explosion. For such an agent, not all logical presuppositions of a question would count as epistemic presuppositions. Here is one example of such a situation:

Thus, for agents with finite epistemic capacities, a question always has a finite number of epistemic presuppositions. This epistemic notion of presupposition is the key to understanding question dynamics.

Question Acceptance

Having clarified the concept of *presupposition*, we can now proceed to unearthing the mechanism of question acceptance. It is clear that agents accept and reject questions, so the question is “how epistemic communities come to accept certain questions as legitimate and others as illegitimate”. This question concerning the mechanism of question acceptance was initially proposed by Rawleigh (Rawleigh, 2018) and is currently accepted as a legitimate topic of scientonomic inquiry. In the broader literature in the field of history and philosophy of science, this question was formulated much earlier and has received some attention. The central question of Nicholas Jardine’s *Scenes of Inquiry* is precisely how questions become real for communities of scientists, where “real” is roughly equivalent to our “accepted” (Jardine, 2000). The problem of question acceptance is also central to Rescher’s *Inquiry Dynamics* (Rescher, 2000). In this section, we will draw on Jardine, Rescher, and others and will consider several possible answers to the question of question dynamics. Our ultimate goal here is to formulate *the law of question acceptance*.

Let us start with what is arguably the most simplistic formulation of a potential law of question acceptance:

- (1) A question becomes accepted only if all of its epistemic presuppositions are accepted.

This basic formulation captures the essence of question acceptance: if theories *a*, *b*, and *c* are epistemically presupposed by question *Q*, then *Q* will become accepted only when *a*, *b*, and *c* are accepted. Consider the example of the question of the distance between the Earth and the sphere of stars discussed above: Aristotelian natural philosophers accepted this question only when the epistemically presupposed theories were accepted.

Implicit in formulation (1) is the assumption that “a question” refers to a question that has occurred to the respective epistemic agent. In other words, the formulation doesn’t imply that any conceivable question becomes accepted when its theoretical presuppositions become accepted; it merely states the mechanism of the acceptance of those questions which the agent formulated or thought of. Consider, for example, the question “Can the increase

When an epistemic agent decides that accepting some theory *A* necessitates accepting some other theory *B*, but not theory *C*, they essentially accept second-order propositions that indicate the *epistemic relevance* of *B* to *A* and irrelevance of *C* to *A*. For instance, an epistemic agent may become aware that accepting the proposition “The sphere of stars exists” implies, by disjunction introduction, that “The sphere of stars exists or it is made of cheese”. Yet, the agent will likely accept that this is epistemically irrelevant. We thank the anonymous reviewer for highlighting this and agree that the notion of epistemic relevance may be a fruitful topic of future research.

We say “roughly”, since Jardine’s notion of *reality* applies not only to questions accepted by local epistemic agents – i.e. to question that he calls “locally real” – but also to questions that he calls “globally real”. In his words, “Whereas the local reality of a question in a community is defined in terms of the considerations they would take to favour one full and direct answer over the others, absolute reality is defined in terms of considerations reliably indicative of the truth of a full and direct answer” (Jardine, 2000, p. 5). Such global reality, according to Jardine, doesn’t depend on “communal beliefs and dispositions” (Jardine, 2000, p. 155).

Given what we know about the process of scientific change, it is highly debatable whether there is such a thing as a globally real question. It is equally debatable whether scientonomy even needs a notion equivalent to that of Jardine’s *global reality*. What is clearly useful in Jardine’s discussion is his analysis of how questions become locally accepted, i.e. how they become part of an agent’s mosaic; he calls this set of locally real questions, “that is, real in a community of practitioners of a given discipline at a given time”, the community’s *scene of inquiry* (Jardine, 2000, p. 4)

of entropy cause a political revolution?”. While both of its key theoretical presuppositions – “Entropy can increase” and “There can be political revolutions” – are accepted, the question itself is not, as it has not, to the best of our knowledge, been formulated till this moment. Now that we have formulated it, it can clearly become accepted, together with an answer to it, “The increase of entropy cannot cause a political revolution”. Yet, the point we are trying to make here is that the mere acceptance of a theory doesn’t automatically lead to the acceptance of all the questions that presuppose the theory. There is an important creative element here: a question

How questions *emerge*, i.e. how and why agents *form* questions, is an interesting question that we will not tackle here. We agree with Gadamer who emphasizes that it takes certain creativity to come up with a question (Gadamer, 2004, p. 359). Since question formation is essentially a creative process, it is unclear whether scientonomy in its current stage can say anything meaningful about it.

must first be conceived of by the epistemic agent.

Obviously, formulation (1) doesn’t state this explicitly in order to stay in tune with the traditional phrasing of other scientonomic laws. Thus, both the law of theory acceptance and the law of method employment concern only theories and methods which have been

formulated or, at the very least, implicitly assumed (Patton, Overgaard, & Barseghyan, 2017; Sebastien, 2016). The same approach is implicit in formulation (1), as well as formulation (2) below.

Now, while intuitive, formulation (1) misses an additional important condition to question acceptance – the acceptance of the proposition that the question itself is *answerable*. It has been noted in the literature that “a question can be raised meaningfully only where there are standards for assessing the truth – or at least the

The idea can be traced back to Kuhn who seems to assert that a problem (question) is accepted in a paradigm when it is accepted that the problem is *solvable* (Nickles, 1978, p. 143).

plausibility – of an answer” (Rescher, 2000, p. 4).

According to Rescher, in order for a question to be *accepted*, an agent must “presuppose not only that it has

an answer but that this answer is, in principle, determinable (identifiable)” (Rescher, 2000, p. 4). Here, Rescher echoes Jardine, who claims that for a question to be accepted (to be “locally real” in his terminology), there should “exist considerations that would be acknowledged in the community as providing grounds for preferring one full and direct answer over all the others” (Jardine, 2000, p. 4). For Jardine, “a question is real in a community of inquirers when they can see how, in principle, to ‘get to grips’ with it” and, consequently, “a question may be unreal for us because there is no consideration that we would take to have the faintest bearing on it” (Jardine, 2000, p. 56). He provides some examples of such unanswerable questions: “Why is there something rather than nothing? Does the absolute exist? Is the organic the image of the planet?” (Jardine, 2000, p. 56). Similarly, Veazie stresses that to be a legitimate topic of inquiry a question must be considered answerable, i.e. “a question that is not answerable is an *illegitimate* question” (Veazie, 2018, p. 5). Consider some examples.

In his *Meditations on First Philosophy*, Descartes presents the propositions “Humans have finite intellects” and “God gave humans their faculties of intellect” (Descartes, 1984, pp. 37-38). A natural question that may arise – and which Descartes formulates – is “Why did God give humans finite intellects?”. However, while this question was indeed formulated, Descartes did not accept it as a legitimate topic of inquiry. This *unacceptance* of the question was due to Descartes’ belief that this question could not be answered, because it lay outside the realm of any possible human knowledge. Thus, while Descartes’ mosaic contained the necessary epistemic presuppositions of the question, it did not contain the theory asserting the question’s answerability.

Another example is that of the contemporary scientific community’s stance on the question of God’s existence. The presupposing theories here are the respective definitions of *existence* and *God* (however vague these may be). Both of these are present in the community’s mosaic and, yet, the community takes an agnostic view of the question and claims that it cannot be answered. In other words, they lack a theory that would state “The question, ‘*does God exist?*’ is, in principle, answerable”. This brings us to our second formulation:

- (2) A question becomes accepted only if all of its epistemic presuppositions are accepted, and it is accepted that the question is answerable.

Importantly, the answerability of a question as it is understood here should not be conflated with the availability of technical means for answering the question. In some situations, we accept a question as a legitimate topic of

inquiry even when we don't think that the question can be answered by the means that are currently at our disposal. Yet, as long as we think that the question is, *in principle*, answerable and as long as we accept all of its epistemic presuppositions, we accept the question. That's the gist of formulation (2).

For instance, consider the contemporary physics community's stance on the question "Do superstrings exist?". Based on the sheer number of publications on the topic (Dine, 2016; Smolin, 2017), we can safely assume that the question is accepted. However, it is also clear that physicists believe that we do not currently possess the technological means required for detecting some of the phenomena predicted by the theory, such as micro black holes or SUSI particles (Lazanu, Lazanu, & Pârvu, 2020). Yet, the community accepts that the question is *in principle* answerable. In general, the fact that the agent is not in a position to answer a question due to limitations in funding, technology, etc. does not affect the acceptance of the question by the agent.

It should be clear at this stage why the *logical* notion of presupposition wouldn't work here. Indeed, if it were the case an epistemic agent accepted a question only after accepting all the logical presuppositions of the question, the agent would not be able to accept any question whatsoever. It is clear that due to their finite epistemic capacities, epistemic agents cannot possibly accept all the logical consequences of their accepted theories. As noted by Berto and Jago, "finite cognitive agents do not know or believe all remote consequences of what they know or believe", for each proposition has infinitely many logical consequences and "they cannot all be computed by a finite mind" (Berto & Jago, 2019, p. 117). Thus, it is safe to suspect that due to lack of logical omniscience, epistemic agents do not accept all logical consequences of their accepted theories. For this reason, we cannot expect epistemic agents to accept all the infinitely many logical presuppositions of a question. In contrast, the epistemic notion of presupposition that we use in formulation (1) as well as in all subsequent formulations isn't suspect to the same risk of horizontal explosion and allows agents to accept a question without accepting all of its logical presuppositions, which is arguably what happens in any real-life situations where epistemic agents have finite capacities.

It is important to note that by switching from the logical notion of presupposition to the epistemic notion, we are only averting the risk of horizontal explosion. There are *prima facie* reasons to suspect that the risk of explosion is still imminent. Since each question can presuppose many theories, and each theory is itself an answer to a question, which presupposes its own theories, which are answers to their own questions, this process can seemingly go *ad infinitum*.

It is an open question how exactly finite epistemic agents avoid explosion. For the purposes of this discussion, it is sufficient to accept that they somehow do so. By the law of theory acceptance, the fate of the logical consequences of presuppositions in an agent's mosaic depends on whether those logical consequences actually occurred to the agent and whether these logical consequences satisfied the requirements of the agent's method. Thus, what's important for the acceptance of the question is the acceptance of its agent-relative epistemic presuppositions.

If this was indeed the case, we would have a *vertical* explosion where, in order to accept a question, the agent would have to first accept all of its epistemic presuppositions together with the questions those presuppositions

answer, as well as the presuppositions of these latter questions and the questions these latter presuppositions answer and so on. Indeed, if each question presupposed at least one theory and each theory was an answer to one question, then in order for an agent to accept a question, they would have to also accept an infinite number of other questions and theories. This sort of vertical explosion is problematic as it renders the process of question acceptance impossible.

This brings us to a dilemma: either there is an infinite chain of questions presupposing theories answering questions presupposing theories etc., or something is wrong with our understanding of the relations between theories and questions. In the latter scenario, we would have to accept either that some questions do not have presuppositions, or that some theories do not answer any questions. As it is inconceivable for a theory not to answer a question, we are currently inclined to think that there might be questions which do not presuppose any theories. Specifically, we refer to *definitional* questions which appear to be at the very core of any question-theory system. For instance, in our example of the Earth and the sphere of the stars, the presupposition “Earth exists” is an answer to the question “Does Earth exist?”, which itself presupposes a definition of “Earth” and a definition of “existence”. These definitions – whatever they might be – are themselves answers to definitional questions concerning the very *meaning* of these words:

We believe it is plausible that any chain of theories and questions culminates at definitional questions, which themselves do not presuppose any further theories. This seemingly goes against Rescher’s view that “all questions have presuppositions” (Rescher, 2000, p. 11). Yet, we think that there is no contradiction between our position and that of Rescher, as Rescher’s notion of *presupposition* is broader than our epistemic notion of presupposition. Specifically, he includes the proposition that “the question is answerable” into the set of the question’s presuppositions. This is evident in his claim that “every question presupposes that it has some true answer or other” (Rescher, 2000, p. 11), i.e. it “has the presupposition that it is meaningful and has an answer” (Rescher, 2016, p. 6). Now, by our definition of *epistemic presupposition*, the proposition stating a question’s answerability is itself *not* a presupposition. Instead, it is an additional condition for accepting the question – a condition stipulated in formulation (2) – but as such, a question doesn’t necessarily presuppose that it has an answer. In other words, being answerable is important for the fate of the question, as it won’t become accepted by the agent

if the agent doesn't accept that it is answerable. Thus, we can agree with Rescher's claim that accepting the proposition "the question is answerable" is a necessary condition for accepting the question, while denying that all questions have presuppositions.

This suggests that only descriptive and normative questions have presuppositions while definitional questions do not. Thus, the multiplicity of the presupposition relation allows for zeros on both ends:

In other words, a question can presuppose any number of theories. To be more specific, descriptive and normative questions necessarily presuppose *at least one* theory, while definitional questions do not presuppose any theories:

Thus, in so far as descriptive and normative questions are concerned, we agree with Rescher: they *must* presuppose some theories, even if those theories appear 'trivial'. Rescher rightly points this out in his *Inquiry Dynamics*, and provides the example of the question, "Are there any truths?". While this question may appear presupposition-free, it does in fact presuppose the theory, "There can be truths – this is something possible" (Rescher, 2000, p. 11). As for definitional questions, we fail to see what theories they can presuppose.

To sum up: we believe that, at the moment, (2) is our best available candidate for the law of question acceptance:

One may distinguish between the first-order theories defining terms and second-order theories about their use. In scientonomy, definitions are understood as first-order theories that state the meaning of a term. Definitions thus understood are answers to definitional questions in the form "What is X ?", that themselves do not presuppose any theories. As for the second-order linguistic theories describing the usage of a term in a language, they perform a function similar to acceptance records but for definitions rather than descriptive or normative theories. Such second-order theories are answers to second order questions that have a form "How is term X used in language L ?" or "How was term X used in language L during time period T ?". Since these second-order questions are descriptive rather than definitional, they clearly presuppose some theories, such as "There exists language L ", "Term X is used in language L " and so forth. We would like to thank the anonymous reviewer for pointing this out.

The Law of Question Acceptance

A question becomes accepted only if all of its epistemic presuppositions are accepted, and it is accepted that the question is answerable.

Note that, in this paper, we do not touch upon the question of *question pursuit*. Clearly, among the accepted questions, some will be pursued, while others will not. This will be decided by the usual considerations of pursuit-worthiness, whatever they might be. This topic is beyond the scope of this paper and will be discussed elsewhere (Barseghyan, forthcoming).

first law and *the zeroth law* (see for instance, Barseghyan, 2015, pp. 168, 173). After the acceptance of Fraser and Sarwar's suggestion to replace the zeroth law with the *compatibility corollary*, the rejection theorems for theories

The compatibility corollary follows from the definition of *compatibility* and recovers the content of Barseghyan's original law of compatibility (Fraser & Sarwar, 2018, p. 71).

and methods are deduced from a conjunction of the law of scientific inertia and the compatibility corollary (Fraser & Sarwar, 2018, pp. 71, 74-75). In any event, to deduce such a theorem for question rejection, we need to ascertain that *the law of scientific inertia* and the notion of *compatibility* are applicable to questions.

Question Compatibility, Inertia, and Rejection

Do the notion of compatibility and the law of scientific inertia apply to questions? Addressing this question is essential if we are to explain the mechanism of question rejection. If the notion of compatibility and the law of scientific inertia were applicable to questions, then explaining why accepted questions stay accepted and how they become replaced would be a relatively straightforward task. Specifically, we would be able to deduce a first law for questions as well as a theorem of question rejection from the two laws. If, however, it turned out that the law of inertia doesn't apply to questions, we would have to find an alternative way of handling the process of question rejection, perhaps by means of reformulating our law of question acceptance. In addition, this would likely call for a reformulation of the law of compatibility and/or the law of scientific inertia so that they would

In such a scenario, we would need a law of question change that would cover both question acceptance and rejection and would not rely on either compatibility or inertia to explain the process. Here is one possible formulation: "If a question's theoretical presuppositions are accepted, the question becomes accepted; if at least one of these presuppositions is rejected, the question becomes rejected." In such a case, we would not need the law of compatibility or the law of inertia to deduce a theorem of question rejection, as the process of question rejection would be handled by the law itself. Needless to say, such an approach would go against the current tradition in scientonomy and would likely require a considerable reconstruction of the whole theory.

Whether this formulation can do the job depends, among other things, on whether we succeed in deducing a theorem concerning the mechanism of *question rejection*. Originally, the rejection theorems for theories and methods have been deduced from a conjunction of *the*

and methods are deduced from a conjunction of the law of scientific inertia and the compatibility corollary (Fraser & Sarwar, 2018, pp. 71, 74-75). In any event, to deduce

only apply to accepted theories and employed methods, but not questions. Naturally, one would like to avoid such drastic changes and instead explain the process of question rejection through more conventional means, i.e. through deducing a theorem of question rejection from a conjunction of the law of scientific inertia and the compatibility corollary. It is our belief that such a conventional approach to question rejection is viable.

The current version of the law of compatibility states (Fraser & Sarwar, 2018):

The Law of Compatibility

If a pair of elements satisfies the compatibility criteria employed at the time, it becomes compatible within the mosaic; if it does not, it is deemed incompatible; and if assessment is inconclusive, the pair can become compatible, incompatible, or its status may be unknown.

Since questions, as epistemic elements, can be part of a mosaic, this law should in principle apply to questions too. But to make sure that it does in fact apply to questions, we first need to ascertain that the very notion of

compatibility/incompatibility of a question with other elements (other questions, theories, etc.) makes sense. To that end, we shall consider two notions: *question-theory compatibility* and *question-question compatibility*.

Let us first consider the notion of *question-theory compatibility*. Our analysis shows that there seem to be two distinct scenarios here. In some cases, a question's incompatibility with a theory is due to the incompatibility between the theory and some of the question's theoretical presuppositions. Consider the question "What is the relationship between the four elements?". The question seems incompatible with the theory that there are not four but three elements. Why is that? The answer, we believe, is in the fact that we consider the theory of three elements to be incompatible with one of the question's presuppositions, i.e. the theory of four elements:

Another type of incompatibility between a question and a theory is that between a question and the theory stating that the question is unanswerable. While such an incompatibility – like any other incompatibility between elements – will depend solely on the agent's local compatibility criteria, it is safe to assume that for many agents question Q will be considered incompatible with the theory " Q is unanswerable" and compatible with " Q is answerable".

Both of these scenarios seem to suggest that we can reasonably speak of question-theory compatibility/incompatibility.

The second notion that must be considered here is that of *question-question* compatibility. At first glance, it might be difficult to conceive how two questions can ever be incompatible, for it is unclear how two epistemic elements lacking any propositional content can ever be incompatible. Yet, we believe, there is at least one sense in which we can legitimately speak of question-question incompatibility. To appreciate this, let us begin by distinguishing between two ways to think about question-question incompatibility: *indirect* and *direct*.

In the former scenario, incompatibility of two questions is expressible as the incompatibility between their respective presuppositions. Suppose, for example, that agent *A* accepts the theory of four elements, whereas agent *B* accepts the theory of three elements. Agent *A* may accept the question, “What is the relationship between the four elements?”, whereas agent *B* may ask, “What is the relationship between the three elements?” These questions would be incompatible indirectly due to the incompatibility of their theoretical presuppositions:

We find this notion of indirect question-question incompatibility unproblematic: since theories can be incompatible with other theories and since questions can be incompatible with theories, it follows that questions can also be incompatible with questions, albeit indirectly via their theoretical presuppositions.

One might be tempted to seek a more direct notion of incompatibility between two questions – one that is not expressible through the incompatibility of their presuppositions. In this second (hypothetical) scenario, two questions would be compatible or incompatible irrespective of the compatibility or incompatibility of their respective presuppositions. If it were the case that two questions can be incompatible in such a direct, irreducible fashion, then it would be theoretically possible for two agents accepting the same set of theories to nevertheless accept mutually incompatible questions.

However, it is unclear whether such a direct incompatibility of questions is at all possible: since questions do not contain propositional content independent of their presuppositions, it is not evident what it would mean for two questions to be incompatible, if not through the incompatibility of their presuppositions. At the moment, we do not have any examples of such direct incompatibility. Thus, for the time being, we conclude that the second scenario of question-question incompatibility is impossible; two questions can be mutually incompatible only indirectly via their respective presuppositions.

Now, since both question-theory incompatibility and question-question incompatibility are possible, we can conclude that one can legitimately apply the notion of compatibility to questions. This is encouraging, as it enables us to explain the process of question rejection in a rather straightforward way and formulate *the question rejection theorem* similar to other rejection theorems. To that end, let us first deduce *the law of scientific inertia for questions*. The current formulation of the law of scientific inertia is as follows (Barseghyan, 2015, p. 123):

1 st Law: Scientific Inertia
An element in the mosaic remains in the mosaic unless replaced by other elements.

Since questions can be part of a mosaic, the first law also applies to questions. The first law for questions – a direct deductive consequence of the general first law – can be formulated along these lines:

1 st Law for Questions
An accepted question remains accepted in the mosaic unless replaced by other elements.

But what can bring about such a replacement? According to Jardine, there are two scenarios of question rejection: agents reject those “questions that are inscrutable for them or whose presuppositions are rejected by them” (Jardine, 2000, p. 58). The former scenario involves the acceptance of a belief that the question is unanswerable, while the latter involves the rejection of some of the question’s presuppositions. Now, how can these two scenarios be explained scientonomically? The underlying mechanism of question rejection, we believe, is similar to the replacement of other elements and closely involves the notion of compatibility. With the first law for questions at hand, we are now in a position to deduce a theorem concerning question rejection:

Consider a couple of examples. First, imagine an epistemic situation where agent *A* initially accepts the question “What is the relationship between the four elements?” together with the theoretical presupposition that there are four elements. Suppose also that at some later time the agent discovers that there are not four but three elements. Naturally, the agent rejects both the theory of four elements *and* the question about the relationships between these elements:

Importantly, this rejection happens regardless of whether it ever occurs to the agent to ask a new question “What is the relationship between the three elements?”. Even if the agent never accepts any further questions concerning the three elements, the question “What is the relationship between the four elements?” would still be rejected.

Consider another epistemic situation, where agent *A* accepts some question *Q*, together with the theory that *Q* is answerable. When agent *A* comes to accept that *Q* is unanswerable, the agent rejects question *Q*. The scientonomic mechanism of this rejection is through the incompatibility of question *Q* and the theory “Question *Q* is unanswerable”:

Rescher distinguishes three scenarios of question rejection – rejection due to impropriety, due to problematicity, and due to ineffability (Rescher, 2000, pp. 50-52). However, a quick analysis shows that all of these three scenarios boil down to the same underlying mechanism, the one described in the question rejection theorem.

Thus, we can conclude that the question rejection theorem covers both scenarios of question rejection indicated by Jardine, i.e. both the rejection “by virtue of utter inscrutability” (unanswerability) and the rejection “by virtue of presupposition failure” (Jardine, 2000, p. 58).

A Quick Illustration

Now that we have both a law of question acceptance and a theorem of question rejection, we should be able to explain actual historical episodes of question change. One illustration of the mechanism of question acceptance and rejection can be found in William Herschel’s work on the physical composition of nebulae (Hoskin, 2011a, 2011b; Schaffer, 1980, pp. 221-227; Fraser, 2006, pp. 79-82). In the late 1770’s, observations of apparent changes in the structure of the Orion Nebula led Herschel to conclude that the nebula was not a distant star-cluster, but

composed of *nebulousity*: fluid, luminous matter distinct from stars. He theorized that some nebulae, “mottled” in appearance, were indeed star clusters, while others which appeared “milky” were instead clouds of nebulousity.

On June 17, 1784, he thus delivered a paper to the Royal Society in which he proposed the question, “Which nebulae are composed of nebulousity, and which are star clusters?”. In the following months, however, after observing that M17 (Omega Nebula) and M27 (Dumbbell Nebula) exhibited properties of both clusters and clouds, Herschel rejected the theory of nebulousity and claimed that all *appearances* of nebulousity could be resolved into stars through the use of sufficiently powerful telescopes. Thus, in rejecting the presupposing *theory* of nebulousity, Herschel also rejected the question, “Which nebulae are composed of nebulousity, and which are star clusters?”.

However, in November 1790, Herschel observed another nebula in Taurus “consisting of a central star surrounded by a small nebulous region” (Fraser, 2006, p. 80). This observation led Herschel to re-accept the theory of nebulousity, and thus the question became accepted as well. In this example, Herschel rejected the question “Which nebulae are composed of nebulousity, and which are star clusters?” in the second half of 1784 as a result of rejecting the question’s theoretical presupposition. The question remained unaccepted by Herschel until 1790, when its theoretical presupposition made its way back into Herschel’s mosaic.

The following diagram summarizes the relevant aspects of the episode:

Needless to say, our discussion of this historical episode is meant as an illustration only; we ignored many otherwise important aspects of this episode so that we could highlight the actual mechanism of question *acceptance* and *rejection* by applying the theoretical framework we have developed. Importantly, the whole process is perfectly in tune with *the law of question acceptance* and *the question rejection theorem*.

Conclusion and Questions for Future Research

The theoretical framework developed in this paper intends to provide a scientonomic account of question dynamics. As we have shown, the process of question acceptance and rejection can be explained by means of the new law of question acceptance and the theorem of question rejection. According to the law of question acceptance that we suggest as a new scientonomic axiom, a question becomes accepted only if all of its epistemic presuppositions are accepted, and it is accepted that the question is answerable. To explain the process of theory rejection in the usual scientonomic fashion (i.e. by means of a rejection theorem that involves the notion of incompatibility), we had to ascertain that the very notion of incompatibility is applicable to questions. Having demonstrated that we can legitimately speak of both question-theory and question-question incompatibility, we have explained the process of question rejection by means of a theorem deducible from the first law for questions and the compatibility corollary. According to the theorem, a question becomes rejected only when other elements

that are incompatible with the question become accepted. This explanatory framework, we believe, is in principle applicable to instances of question change.

We would like to conclude by suggesting several questions that we believe can become fruitful topics for future research. First, in this paper, we skirted the issue of indicators of question acceptance by assuming that often there are some clear indicators for identifying that a question was accepted by an epistemic agent at a certain time. Among such rather straightforward indicators are the fact that the question had an accepted answer or that the question was actively pursued by the agent. Yet, we didn't address the more general question of the indicators of question acceptance. As such, this question, formulated by Rawleigh in 2018, still awaits its proper treatment.

Our second question concerns the role of sociocultural factors in question acceptance. It is currently accepted in scientonomy that sociocultural factors can affect the process of theory acceptance insofar as it is permitted by the method employed at the time (Barseghyan, 2015, pp. 233-240). A similar question can be asked concerning the role of sociocultural factors in the process of question acceptance: what is the role of sociocultural factors, such as economics or politics, in the process of question acceptance?

Another interesting question worth investigating concerns possible ways in which accepted questions can be affected by employed methods. In his account of question dynamics, Jardine suggests that methodological commitments are “the primary immediate determinant of the reality of the questions” (Jardine, 2000, p. 78). According to Jardine, questions are determined by “methods of production, presentation and adjudication of claims local to particular disciplines, particular periods and particular communities and sites of inquiry” (Jardine, 2000, p. 146). It is unclear, however, how this relation between methods and questions – if one indeed exists – can be conceptualized by scientonomy.

Finally, it seems possible to distinguish between several types of presuppositions; for instance, Jardine distinguishes between *existential*, *explanatory*, and *categorical* presuppositions (Jardine, 2000, pp. 79-83). If it turns out that there are indeed different types of epistemic presuppositions, then it is possible that different types of presuppositions play different roles in question dynamics. Thus, it is important to inquiry into the typology of epistemic presuppositions.

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Suggested Modification

We suggest the following modifications:

[Sciento-2021-0001]

Accept the following definitions of *logical presupposition* and *epistemic presupposition*:

- *Logical Presupposition* $\equiv$ a theory is said to be a logical presupposition of a question, *iff* the theory is logically entailed by any direct answer to the question.

Logical Presupposition $\equiv$
A theory is said to be a logical presupposition of a question, <i>iff</i> the theory is logically entailed by any direct answer to the question.

- *Epistemic Presupposition* $\equiv$ a theory is said to be an epistemic presupposition of a question for some agent, *iff* the agent accepts that accepting any direct answer to the question will necessitate accepting the theory.

Epistemic Presupposition $\equiv$
A theory is said to be an epistemic presupposition of a question for some agent, <i>iff</i> the agent accepts that accepting any direct answer to the question will necessitate accepting the theory.

Also accept the following question as a legitimate topic of scientonomic inquiry:

- *Types of epistemic presuppositions*: what types of epistemic presuppositions are there?

[Sciento-2021-0002]

Accept *the law of question acceptance* as a new scientonomic axiom:

- *The Law of Question Acceptance*: a question becomes accepted only if all of its epistemic presuppositions are accepted, and it is accepted that the question is answerable.

The Law of Question Acceptance
A question becomes accepted only if all of its epistemic presuppositions are accepted, and it is accepted that the question is answerable.

Accept *the question rejection theorem* as a deductive consequence of *the first law* and the *compatibility corollary*:

- *Question Rejection Theorem*: a question become rejected when other elements that are incompatible with the question become accepted.

Also accept the following questions as legitimate topics of scientonomic inquiry:

- *Role of sociocultural factors in question acceptance*: what is the role of sociocultural factors, such as economics or politics, in the process of question acceptance?
- *Role of employed methods in question acceptance*: is the process of question acceptance affected by employed methods?

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