

# The Pragmatics of explanation: Remarks on van Fraassen's theory of why-questions<sup>1</sup>

*A Pragmática da explicação: Comentários sobre a teoria das questões-por-quê de van Fraassen*

**Renato Cesar Cani**

Universidade Federal do Paraná – UFPR/CAPES – Brasil  
renatocani@gmail.com

**Abstract:** In this article, my aim is to analyze Bas van Fraassen's pragmatic solution to two of the traditional problems concerning scientific explanation, namely, rejection and asymmetry. According to his view, an explanation is an answer to some request for information. The emergence of a question, as well as the evaluation of the explanations adduced, depends on considerations about contextual factors. In addition, I will evaluate the pertinence of objections raised by Philip Kitcher and Wesley Salmon against van Fraassen's account. I will argue that their charge is not sound, for it actually misunderstands the role played by context in van Fraassen's account. Although Salmon's and Kitcher's realist commitments motivate the point made by them, I will hold that a pragmatic account of explanation does not commit one to an anti-realist approach to science.

**Keywords:** Pragmatics of Explanation. Bas van Fraassen. Why-questions. Asymmetry. Realism.

**Resumo:** Neste artigo, meu objetivo é analisar a solução pragmática oferecida por Bas van Fraassen a dois dos tradicionais problemas da explicação científica, quais sejam, o da rejeição e o da assimetria. Em sua visão, uma explicação é uma resposta a alguma demanda por informação. O surgimento de uma questão, bem como a avaliação das possíveis explicações, depende de fatores contextuais. Além disso, avaliarei a pertinência das objeções de Philip Kitcher e Wesley Salmon contra a concepção de van Fraassen. Argumentarei que suas objeções não são fortes o bastante, tendo em vista que elas interpretam incorretamente o papel dos contextos na concepção de van Fraassen. Embora os argumentos de Salmon e Kitcher sejam motivados pelos comprometimentos realistas subscritos por eles, sustentarei que uma concepção pragmática da explicação não implica comprometimento a uma visão antirrealista da ciência.

---

1 I would like to thank the Organizing Committee of 16th International Meeting on Pragmatism (2015), for fruitful discussions on a previous version of this paper. In addition, I would like to thank CAPES, for financial support to my research, and José Eduardo Porcher, for reading and revising this paper.

**Palavras-chave:** *Pragmática da Explicação. Bas van Fraassen. Questões-por-quê. Assimetria. Realismo.*

## Introduction

The philosophical debate on scientific explanation received a major contribution from the seminal essay by Hempel and Oppenheim (1948). That work is part of an effort to provide a pure formal analysis in order to capture the logical structure of explanations in the realm of natural science. So, the approach proposed by the authors—and later developed by Hempel (1965)—focuses on pure logical relations instead of pursuing the ontological character of causality, which the traditional view on explanation considered to be a fundamental task. Whereas the literature on scientific explanation reveals several controversies in which the Hempelian account is involved, some philosophers argue that the logical structure proposed by Hempel is not enough to define the nature of explanations. In general, realist philosophers defend that explanations capture the causal relations within the world, so that they provide understanding beyond what a purely argumentative structure can reveal. In this article, I will analyze Bas van Fraassen's pragmatic account of explanation, in which there is no need to postulate a theoretical realm of causality (however he concedes that explanation cannot be reduced to logic).

According to Hempel, an explanation of a particular phenomenon consists in an *argument* whose conclusion is a proposition expressing the fact to be explained (*explanandum*) and whose premises (*explanans*) contain at least one established scientific law. Thus, the Hempelian model of scientific explanation is also known as the *covering-law model*. In the case of events covered by deterministic laws, the author proposes the *deductive-nomological* (D-N) model. A D-N explanation is, therefore, a deductive argument which implies the *explanandum* with deductive certainty. On the other hand, if the event to be explained is covered by probabilistic laws, Hempel proposes the *inductive-statistical* (I-S) model, in which explanations are identified with arguments that imply the *explanandum* “with near-certainty or with high probability.” (HEMPEL, 1999, p. 307). So, as Hempel conceives it, the knowledge provided by explanations is not different from that provided by descriptions. If we are able to give an explanation for a fact *A*, that means we have good grounds for believing that *A* is the case (or, conversely, that *A* will be the case, for Hempel defends the symmetry between explanation and prediction). In other words, explanatory power is not a theoretical virtue beyond the empirical domain.

Nevertheless, as we shall see, in the face of conceptual problems concerning the Hempelian model, some philosophers have argued that there must be something *extra* to scientific explanation, beyond empirical factors. Realist philosophers, such as Wesley Salmon and Philip Kitcher, argue that we must identify these missing elements with objective features within the world, which provide us with understanding of the underlying structure of the world itself. While Salmon (1998) argues for an *ontic* conception of scientific explanation, based on the concept of causal process, Kitcher (1993), in turn, proposes an *unificationist* theory of explanation. Despite the peculiarities of either approach, both authors are concerned with pursuing objective criteria for establishing the explanatory power of scientific theories,

so that these criteria can provide an effective instrument to distinguish between empirically equivalent theories.<sup>2</sup> Thus, in their realist view, explanatory knowledge reaches a deeper level of reality than merely descriptive information, because only explanations can capture the real causal connections that exist in the world. Against this view, van Fraassen proposes a pragmatic account of explanation based on a theory of why-questions. This theory is intended to fit scientific explanations within the empiricist landscape projected by the author. According to him, explanatory power is a pragmatic virtue, not a theoretical one. Thus, van Fraassen argues that explanations and descriptions can be distinguished strictly in terms of pragmatic factors, for the type of information provided by descriptions is not intrinsically different from that provided by explanations.

In section 2, I will present the major difficulties faced by the D-Nmodel, namely the *rejection* and the *asymmetry* problems. As we shall see, these two problems—mainly the latter—provide motivation for the realist philosophers who want to defend objective criteria of explanatory power, for they hold that the asymmetries of explanation can be explained in terms of objective causal asymmetries within the world's structure. In section 3, I will analyze van Fraassen's theory of why-questions, which intends to reinterpret these problems in a pragmatic light. Then, in section 4, I will present some of the objections posed by Kitcher and Salmon towards van Fraassen's account, which consist basically in the attempt to show that his conception is caught in a dilemma: either he admits that the laxity of conditions imposed by his pragmatic criteria implies its trivialization, or he must admit realist conditions in order to avoid that undesirable consequence. Finally, I intend to show how the strength of the realist charges against van Fraassen's account might be diminished if we correctly consider the role played by *context* in his analysis.

## 1 The two major problems: rejection and asymmetry

The literature on scientific explanation provides a good deal of counterexamples to the covering-law model. Salmon (1989) enumerated seven main cases that had been mentioned by philosophers during the two or three decades after the publication of the first essay by Hempel and Oppenheim. Some of these examples have to do with the role of causality in scientific explanation, such as the “barometer” and the “eclipse” cases. In the former, since we can infer the occurrence of a storm based on the reading of a barometer, the logical conditions imposed by Hempel on the D-N model imply that the barometric reading explains the storm. However, Salmon argues that it is just not right, for both the barometric reading and the occurrence of the storm are explained by the same cause, namely the atmospheric changes

---

2 Explanatory power has been invoked by many philosophers in order to give a realist response to the *underdetermination thesis*, which is a strong argument against scientific realism. According to this thesis, there is no objective criterion to distinguish between empirically equivalent theories, even if these theories disagree at the unobservable level. So, the anti-realist philosopher concludes that our beliefs in theoretical entities are undermined by empirical data, so that a fictionalist view on the unobservable realm is the most rational one. However, if the realist is right and the explanatory knowledge provides us understanding about the causal structure of the world, thus we are able to break the underdetermination.

in a certain region. Another group of counterexamples focuses on the problem of explanatory relevance, such as the “hexed salt” and the “birth-control pills” cases. The latter describes a case in which a man, Peter, has taken birth-control pills during several months and, thus, has not become pregnant. Although taking the pills has not any relevance to the consequence (since Peter is a male), the explanation “Peter has not become pregnant because he has taken birth-control pills” fits Hempelian criteria.<sup>3</sup>

I will focus on another group of counterexamples, namely the one which concerns the controversial symmetry between descriptions and explanations, proposed by Hempel and Oppenheim. I will mention two cases: the *paresis* case and the example of the *shadow cast by a tower*. As we shall see, these cases lead to two different problems, the *rejection* and the *asymmetry* problems, respectively.

Firstly, let us analyze the *paresis* case: paresis is a disease that may afflict people who have latent untreated syphilis. However, only a small part of untreated syphilitics contract paresis. Let us suppose that John is a man who has syphilis in the primary stage. So, since the Hempelian criterion for statistical explanations conceives it as arguments that must entail the fact to be explained with *high probability*, the correct prediction in this case is that John will not contract paresis, for the probability of this happening is considerably small. Therefore, a single case of a person who develops this disease being an untreated syphilitic is a counterexample to Hempelian model. In addition, if we imagine that John is in such a condition, as van Fraassen points out, “we can explain why John, rather than his brothers, contracted paresis, for he had syphilis; but not why he, among all those syphilitics, got paresis.” (VAN FRAASSEN, 1980, p. 111). As we shall see, the correct solution to this difficulty, according to van Fraassen, is that the second question must be rejected; for the context imposes that there cannot be an answer to that doubt. However, van Fraassen emphasizes that neither the Hempelian model nor the account of explanation based on statistical relevance are able to give us a reason why we must put aside that request for explanation. Besides the paresis case, van Fraassen argues that the rejection problem arises in several domains of scientific enquiry, such as modern physics. For instance, a physical theory can give us the probability of radioactive decay for uranium atoms in general; however, it cannot explain why a particular atom has disintegrated right now and not later.

Secondly, let us consider the example of the *shadow cast by a tower*, a traditional case of the asymmetries of explanation. Imagine a tower of height  $b$  and assume that the angle of incidence of the Sun on the earth is  $\alpha$ . So, the length of the shadow cast by the tower ( $l$ ) can be deduced from the laws of geometrical optics about the transmission of light, which entail that:  $l = b/\tan \alpha$ . Since the relation given by the law is mathematical, the argument can be written in two directions:

---

3 In fact, Hempel (1999) postulates “explanatory relevance” as a requirement for construing valid scientific explanations. His intention is clearly to avoid examples such as the “birth-control pills”. However, Salmon (1989) argues that Hempel does not provide clear criteria to define “relevance” satisfactorily, for his account is bounded to logical structure. The counterexamples mentioned above are fully discussed in Salmon (1989, p. 46-51) and Kitcher (1989, p. 410-412).

- 1) Considering  $b$  and  $\alpha$  as premises, the conclusion is  $l$ .
- 2) Considering  $l$  and  $\alpha$  as premises, the conclusion is  $b$ .

It is clear that both (1) and (2) fit the D-N pattern of explanation, so that Hempelian logical analysis entails that both should count as valid explanations. Of course, it is clear that Hempel would not want to admit deduction (2) as a valid explanation; however, the covering-law model cannot give us a criterion to explain this *asymmetry*. If we want to admit that (1) should count as an explanation and (2) should not, we must give an account of the asymmetry between both deductions. As we shall see, the realist defends that this asymmetry is a consequence of the real asymmetry of the causal order of events in the world. On the other hand, the pragmatist argues that the asymmetry between (1) and (2) by changing the context in which the request for explanation arises.

Although this example may suggest that the asymmetry problem is quite trivial, van Fraassen emphasizes that it also arises in more complex domains, as the cosmological redshift within modern physics. While general relativity implies that the expansion of the universe occurs if and only if distant light sources show redshift, the latter can be explained in terms of the former, but not the opposite. It is not difficult to see that we could adapt the deductions (1) and (2) to this case. So, according to van Fraassen, the examples mentioned above show that "in such cases, two propositions are strictly equivalent (relative to the accepted background theory), and the one can be adduced to explain why the other is the case, but not conversely." (VAN FRAASSEN, 1980, p. 104). As I will try to show in the next section, van Fraassen argues that the asymmetry problem is a consequence of Hempel's flawed definition that explaining a phenomenon consists in showing an argument that provides good grounds for believing that such a phenomenon was to be expected.

## 2 Bas van Fraassen's pragmatic account of scientific explanation

In *The Scientific Image* (1980), Bas van Fraassen argues for an empiricist view of science, in which there is no place for metaphysical considerations. Against scientific realists, he urges that the sole objective of scientific theories is to obtain empirical adequacy, instead of truth conceived as a correspondence at the observable as well as at the unobservable level.<sup>4</sup> Besides, the author poses skeptical doubts on notions such as necessity, universality and causality. Indeed, van Fraassen's pragmatic account of explanation is an important part of his empiricist project, for he advances arguments against those who think that explanatory knowledge provides access to natural necessities or causal interactions, construed realistically. Against what he considers "flights of fancy" of philosophers who dangerously "return to essentialism

---

<sup>4</sup> In a later book, van Fraassen (2002) construes his empiricist project as a philosophical attitude towards experience, which defends the "rejection of explanation demands and dissatisfaction with and devaluing of explanation by postulate." (VAN FRAASSEN, 2002, p. 47). These explanation demands refer to the metaphysical argumentation which tries to justify postulations on the unobservable level.

or to new-Aristotelian realism” (VAN FRAASSEN, 1980, p. 155), van Fraassen denies that explanatory power has anything irreducible or special that can be used to distinguish between empirically equivalent theories. The difference between description and explanation is a *pragmatic* distinction, not a theoretical one.

While Hempel and the realists theorize about explanation as though it were a pure relation between theory and facts, van Fraassen comprehends it as a three-term relation, that is to say a relation between theory, facts and *context*, so that in his view “scientific explanation is not (pure) science but an application of science” (VAN FRAASSEN, 1980, p. 156).<sup>5</sup> Thus, an explanation is neither a set of propositions nor an argument; it is rather an *answer* to some *why-question* that emerges in a certain context. Van Fraassen defines a question as follows: “a *question* is an abstract entity; it is expressed by an *interrogative* (a piece of language) in the same sense that a proposition is expressed by a declarative sentence” (VAN FRAASSEN, 1980, p. 137-138). So, a why-question is conceived as a request for explanation expressed by an interrogation of the form “Why *P*?” that emerges in a particular context, which depends on three factors: the topic *P*; the contrast class  $X = \{P_1, P_2, \dots, P, \dots\}$  and the relevance relation *R*. The contrast-class determines a set of alternatives to *P*, so that asking “Why did Adam (and not Eve) eat the apple?” is different from asking “Why did Adam eat the apple (and not the orange)?” As the context determines the contrast-class, it also determines the relation of explanatory relevance, that is to say “the respect-in-which a reason is requested, which determines what shall count as a possible explanatory factor” (VAN FRAASSEN, 1980, p. 142). A direct answer (*A*) to that question can be expressed as “*P* is the case (in contrast with the rest of *X*) because *A*”. The adequacy of this answer (explanation) will be evaluated in terms of the relevance relation *R*.

Formally, a why-question *Q* is defined as follows:  $Q = \langle P, X, R \rangle$ . Thus, van Fraassen hopes to solve both problems mentioned in the previous section. First, let us consider the rejection problem, raised by examples like that of paresis. According to van Fraassen, in each context there is a certain body *K* of background knowledge which involves the accepted scientific theories and the factual information available in that particular situation. Since this background depends on both the questioner and the audience, it is clear that it may vary depending on the context in which a question emerges. Therefore, van Fraassen considers that “it is this background which determines whether or not the question arises; hence a question may arise (or conversely, be rightly rejected) in one context and not in another.” (VAN FRAASSEN, 1980, p. 145). In the example mentioned above, concerning the explanation of the fact that John developed paresis, we can infer that the interrogative sentence “Why did John contract paresis?” involves more than a single question. There are at least two different questions implicit in this formulation, their difference being precisely the contrast-classes involved in each one. In other words, the question emerges (and

5 As Dutra (2009) points out, the contrast between van Fraassen’s theory of explanation and those advanced by Hempel, Salmon, Popper and other philosophers of science is that van Fraassen is the only one who classifies “explanatory power” as a pragmatic virtue of scientific theories instead of classifying it as a theoretical property. Therefore, he conceives explanation not as an intrinsic quality of the theories themselves, but as a quality that may be attributed only to the applications of the theory.

can be answered properly) if the contrast-class is identified with the set of John's brothers. Thus, in this case, the answer "Because John had latent untreated syphilis" is perfectly adequate. However, if the contrast-class is identified with that of every people with untreated syphilis, the question simply does not emerge; it is rejected because the background knowledge *K* (the medical sciences) implies that there could not be an answer to that question in that context.

Indeed, van Fraassen claims that these considerations are useful to deal not only with simple examples like that, but also with several cases in the history of science, where some pattern of explanation is accepted in a context, then rejected in another. For instance, Newton himself and his contemporaries considered that the theory exposed in the *Principia* did not fully explain the gravitational phenomena, for Newton was unable to indicate precisely the "cause of gravity". However, in face of the great empirical success exhibited by Newtonian mechanics in the 17<sup>th</sup> and 18<sup>th</sup> centuries, the scientists paid less and less attention to the question of pursuing the underlying causes of gravitational phenomena, so that the scientific enquiry eventually arrived at a stage where this problem was considered illegitimate.<sup>6</sup> In other words, that stage defined a context in which no request for explanation of the "cause of gravity" was required; that question was eventually rejected by scientists.

While the solution to rejection problem relies on considerations about background knowledge and contrast-classes, as we saw above, van Fraassen's answer to the asymmetry problem is based on the analysis of contextual *relevance*. The author claims that the relation of explanatory relevance changes if we change the context in which the question arises, so that he argues: "if that is correct, if the asymmetries of explanation result from a contextually determined relation of relevance, then it must be the case that these asymmetries can at least sometimes be reversed by a change in context." (VAN FRAASSEN, 1980, p. 130) In order to illustrate this argument, van Fraassen tells a story called "The Tower and the Shadow" (VAN FRAASSEN, 1980, p. 132-134), in which he creates a context where the height of a tower can be appropriately explained by the length of its shadow. In the story, there is a Chevalier who commanded that a tower be built next to the terrace of his own castle. According to the tale, a visitor once noticed that the shadow cast by the tower covers the terrace of the castle at the time of the sunset and got curious about it. First, the visitor asked the Chevalier for an explanation of that fact, having received the following response: both the spot where the tower was built and its height have been chosen in honor of the Chevalier's ancestors. In association with the laws of geometrical optics, these facts explain the length of the shadow. However, distrusting the Chevalier's story, the visitor then asks the same question for a servant, having received the following response:

---

6 Newton clearly admitted that such an unobservable cause did exist, so that in the *Opticks* he argued that experimental philosophers should pursue the metaphysical foundations of the attractions observed in nature: "There are therefore Agents in Nature able to make the Particles of Bodied stick together by very strong Attractions. And it is the Business of experimental Philosophy to find them out." (NEWTON, 1721, p. 369). However, this enquiry has not reached conclusive results. This fact is also mentioned by Hilary Putnam (1983), in order to corroborate his point that modern science progressively denies metaphysical hypotheses, in favor of considerations concerning the mere descriptive domain.

That tower marks the spot where he [the Chevalier] killed the maid with whom he had been in love to the point of madness. And the height of the tower? He vowed that the shadow would cover the terrace where he first proclaimed his love, with every setting sun—that is why the tower had to be so high. (VAN FRAASSEN, 1980, p. 133-134).

In the servant's report, it is the length of the shadow—associated with the intentions of the Chevalier—which explains the height of the tower. Thus, the tale proposed by van Fraassen aims to show that the asymmetries of explanations are not grounded on asymmetries in the causal order of the world, but are grounded on contexts in which the questions arise. What van Fraassen is trying to say is that a consequence of defining explanations as answers to why-questions is taking into account that a request for explanation can be made according to several different interests. Thus, the author mentions the Aristotelian fourfold typology of causes (formal, material, efficient and final) as a simplified scheme of the variety of interests that may guide a questioner and its audience, so that explanations based upon each one of these causes could be required in different contexts. In the example considered above, the explanation given by the servant may be considered as a valid answer for the question "Why must the tower be so high?" because the context does not imply any restriction to information concerning the intentionality of the tower builder. Hence, the pragmatic relation of contextual relevance would do away with the asymmetry problem.

### 3 Objections to van Fraassen's account

As we saw in the previous section, van Fraassen claims that his pragmatic theory of why-questions can solve the traditional problems that troubled the Hempelian view. In this section, I will analyze some of the objections posed by Philip Kitcher and Wesley Salmon against van Fraassen's account. They admit the pragmatic component of scientific explanations, and concede that the theory proposed in *The Scientific Image* is the best one available to explain this dimension. Nevertheless, they claim that explanation cannot be fully reduced to pragmatics. In other words, Kitcher and Salmon want to "underscore the difference between a theory of the pragmatics of explanation and a pragmatic theory of explanation." (KITCHER and SALMON, 1987, p. 315). Although van Fraassen's proposal is a good theory of the pragmatics of explanation, the authors argue that a pragmatic theory of explanation is impossible, for explanatory knowledge involves non-pragmatic factors which cannot be ignored. In order to support their point, they present three objections to van Fraassen's account.

(I) *Lack of constraints on the relevance relation.* According to Salmon, it seems that the relevance relation  $R$  is not properly defined by van Fraassen, so that in his view, causes can be explained by its effects. Naturally, it seems inadmissible in light of the realist commitment that the asymmetries of explanation occur due to asymmetries of the causal order. Hence, Salmon (1989, p. 141-143) remarks that van Fraassen's comments on the relation of explanatory relevance are purely informal, so that his pragmatic account does not impose any formal restriction on what kind of relation should be considered relevant. The only requirement made by van Fraassen is that an explanation, in order to be scientific, must give information based on



an accepted scientific theory, besides being evaluated according to it. However, Kitcher (1989, p. 415) emphasizes that there are no such requirements concerning relevance relations. In addition, he observes that when van Fraassen discusses concrete relevance relations, the examples invoked by him involve familiar kinds of relations, such as “physical necessitation”, “intentional relevance”, and “being etiologically relevant”. Nevertheless, when the discussion is directed towards the formal definitions of explanatory relevance, his account does not put any explicit constraint on these relations. Thus, Kitcher and Salmon claim that “there are some relations that ought not to be allowed in *any* context as genuine relevance relations.” (KITCHER and SALMON, 1987, p. 325).

Salmon illustrates that point with an ingenious example. Consider the following question “Why did John Kennedy die in 22 November 1963?” formally defined as  $Q = \langle P, X, R \rangle$ , so that  $P$  (the topic) is “John Kennedy died in 22 November 1963”; the contrast-class  $X$  is defined by the set of dates different from “22 November 1963” and the relevance relation is *astral influence*. Considering a context  $K$  of background knowledge which includes some accepted astrological theory, it follows that an answer  $A$  would be adequate if it contains some accurate description of the configuration of planets and stars at the day of Kennedy's birth. Thus, Salmon claims that this answer fits van Fraassen's requirements for the validity of scientific explanations. Salmon and Kitcher regard this case as evidence of the incompleteness of van Fraassen's account, for his theory should provide instruments to reject this kind of question, whereas astral influence does not have explanatory relevance nowadays: “We suggest that, in the context of twentieth-century science, the appropriate response to the question is rejection. According to our present lights, astral influence is not a relevance relation.” (KITCHER and SALMON, 1987, p. 322).

Therefore, the authors claim that a basic task for a theory of explanation is to define what should (and what should not) count as genuine relations of explanatory relevance. Moreover, Kitcher (1993) defends that a scientific picture cannot be complete until it sets up clearly the accepted patterns of valid scientific explanations, for our beliefs are grounded on such standards. In other words, Kitcher argues that the “scientific image” proposed by van Fraassen avoids the discussion of defining what relevance relations must be regarded as plausible. According to the realist view defended by Kitcher and Salmon, this task cannot be accomplished by the mere claim that “context determines everything”; instead, it requires that we mention an irreducible non-pragmatic dimension.

(II) *The threat of trivialization*. The second objection follows from the first one. Actually, it can be read as an extension of the former. According to Kitcher, the laxity of conditions on the relevance relation entails that van Fraassen's account is vulnerable to trivialization. In other words, in principle any true proposition can explain any other true proposition. Kitcher puts it formally as follows:

Let  $A, B$  both be true. [...] We construct an appropriate question as follows: let  $X = \{B, -B\}$ ,  $R = \{\langle A, \langle B, X \rangle \rangle\}$ . Provided that [the context]  $K$  entails the truth of  $B$  and does not contain any false proposition entailing the nonexistence of any truth bearing  $R$  to  $\langle B, X \rangle$ , then the question  $\langle B, X, R \rangle$  arises in  $K$ , its topic is  $B$ , and its only direct answer is  $A$ . (KITCHER, 1989, p. 415).

This example intends to reinforce the realist claim that a satisfactory characterization of scientific explanation must impose some objective constraints to what may count as relevant information. According to Salmon, “we need to appeal to objective nomic relations, causal relations, or other sorts of physical mechanisms if we are to provide adequate scientific explanations” (SALMON, 1989, p. 145). As Richardson correctly points out, the core of the realist criticism to the pragmatic view advanced by van Fraassen is the attempt to raise a dilemma for his conception: “it either relies covertly on scientific realism or trivializes scientific explanation” (RICHARDSON, 1995, p. 112). In other words, if van Fraassen keeps his point that explanation can be reduced to pragmatics, his account will be trivialized; the only way out is accepting some objective non-pragmatic feature that would block trivialization. Kitcher puts this point as follows: “Our primary tasks are to achieve a language that recognizes natural divisions and a set of explanatory schemata that pick out dependencies” (KITCHER, 1993, p. 150). In addition, Salmon concludes that van Fraassen’s theory does not show how to avoid regarding as scientific those explanations based only in subjective matters. Hence, as we saw before, the realist view advanced by Kitcher and Salmon is committed to the claim that it is possible to access deeper levels of reality through explanatory knowledge, so that the mere reference to contextual factors is not able to elucidate this level.

(III) *The claim that van Fraassen solved the asymmetry problem is incorrect.* While Kitcher and Salmon concede that van Fraassen’s solution to the rejection problem is correct, they argue that the asymmetries of explanation cannot be treated pragmatically. In the example of the tower and the shadow mentioned above, van Fraassen claims that there is a context in which the length of the shadow cast by a tower can explain the height of the tower. Nevertheless, Kitcher argues that this is not correct, for the explanation given by the servant in the Chevalier story relies on the *intention* of the builder. Therefore, Kitcher argues that, in order to solve the problem properly, van Fraassen should have formulated an explanation in which the explanatory role was played by the length of the shadow itself. “Thus it has seemed that van Fraassen does not touch the Hempelian problem of distinguishing the explanatory merits of two derivations [...], and that the claim to have solved the problem of asymmetry is incorrect” (KITCHER, 1989, p. 416). In other words, Kitcher claims that the asymmetry problem, as van Fraassen takes it, is not adequately posed, whereas his story does not explain why the *same* argument is rejected as explanatory in one context and accepted in another. Instead, the context created by him shows only that we can derive the height of the tower by a D-N argument which takes the Chevalier’s attitudes as premises. However, the original problem of asymmetry involves explaining whether there is a context in which the length of the shadow plus the geometrical optics and the inclination of the sun indeed explain the height of the tower.

#### 4 Context, relevance and asymmetry revisited

I will now argue that a careful analysis of the role played by *context* in van Fraassen’s account shows that the charges advanced by Kitcher and Salmon rely on misunderstandings.

First, let us trace back objection (I), which concerns the lack of restrictions on the relevance relation. According to Kitcher and Salmon, van Fraassen’s pragmatic

account allows an “anything goes” view of scientific explanation. As we saw, when the realist argues for commitments concerning the relation of explanatory relevance, s/he is actually claiming that what should count as relevant information must be determined through *objective criteria*, which a correct scientific picture should define *a priori*. However, it is precisely towards this point that van Fraassen's formulates his criticism for the pragmatic definition of a relevance relation implies that it is fully context-dependent. Inasmuch as scientific explanation concerns concrete applications of science (not merely theoretical science), the realist point that explanations must rely on objective causes is undermined by context.<sup>7</sup> Hence, the relation of explanatory relevance cannot be defined prior to the emergence of a why-question, and this presupposes a context which will determine the relevance relation, so that, according to van Fraassen, “the salient feature picked out as ‘the cause’ [...] is salient to a given person because of his orientation, his interests, and various other peculiarities in the way he approaches or comes to know the problem—contextual factors” (VAN FRAASSEN, 1980, p. 125).<sup>8</sup>

These brief considerations provide elements to formulate a response to the Kennedy example mentioned in previous section. According to Salmon, a theory of explanation should prohibit relevance relations as “astrological influence” in order to be satisfactory, for this is not a pattern of explanation admitted nowadays. However, if we carefully analyze van Fraassen's definition of context, it will be clear that a context implies a background of accepted knowledge (*K*), so that the context contains *scientific theories*: “no factor is explanatorily relevant unless it is scientifically relevant; and among the scientifically relevant factors, context determines explanatorily relevant ones” (VAN FRAASSEN, 1980, p. 126). Hence, if astrological influence is not scientifically accepted in our present context, as Salmon believes, it is impossible for a why-question with this relevance relation to arise, since *K* does not contain any astrological theory. The pragmatic view advanced by van Fraassen does not need to prohibit this kind of relation *a priori*, for if the context does not take this relation into account, it will simply be outside the background knowledge which supports why-questions. On the other hand, if there

---

7 In order to illustrate this point, van Fraassen cites an example formulated by Hanson (1958, p. 54): imagine a car crash in which the driver passes away. If we ask different persons (for instance, a doctor, a highway patrolman and a car mechanic) for the causes of death, we might receive different explanations (respectively, “hemorrhage”, “driver's negligence” or “mechanical failures”). Hence, the relevance relation cannot be established *a priori*.

8 Indeed, van Fraassen (1985) argues against Salmon's account of explanation, based in concepts like “causal processes” and “causal interactions.” According to van Fraassen, this kind of model faces several difficulties if one tries to apply it to quantum mechanics, for the different interpretations of the quantum theory involve different ontological commitments. Accepting a causal explanation would imply choosing among these interpretations, yet this choice is not possible in face of the current stage of scientific development. “A realist [...] must face the fact that quantum theory is today all but universally accepted in the scientific community, with no more qualification than such acceptance ever receives in practice, and without such a choice between interpretations, and without anxiety about when the interpretations being developed will become complete and trouble-free.” (VAN FRAASSEN, 1985, p. 644).

is an available context in which an astrological theory is considered a valid pattern of discovery, then admitting this relation as relevant for explanations (in such a context) must not present any difficulty at all.

Thus, there is little left to be said about objection (II), for this line of criticism is very close to the one discussed above. In order to prove that van Fraassen's account is vulnerable to trivialization, Kitcher advanced an example of a simple relation  $R = \{ \langle A, \langle B, X \rangle \rangle \}$  that would imply that any proposition  $A$  could explain any other proposition  $B$ . However, if our understanding of van Fraassen's argument is right, since the contexts in which the why-questions arise contain scientific information admitted as valid, it seems difficult to imagine how such a relation would be possible, for the definition of explanatory relevance comes from the same context which includes the accepted scientific theories. Richardson puts this point in a very clear way: once the context sets "certain shared theories, [...] it is from among these scientifically relevant factors that the relevance relation of the question expressed by that interrogative must come. This disallows Kitcher and Salmon's silly relations" (RICHARDSON, 1995, p. 121). Hence, it becomes clear that van Fraassen's pragmatic account does not allow an "anything goes theory of explanation" (KITCHER and SALMON, 1989, p. 330), for he offers a *naturalistic* solution to the establishment of relevance relations.<sup>9</sup>

Finally, let us consider objection (III), which concerns the charge that van Fraassen did not handle properly the asymmetries of explanation. Indeed, Kitcher and Salmon approach the problem as it appears in the discussion about the D-N model of explanation. As we saw in the case of the shadow cast by a tower, the question is how to explain why argument (1) is considered explanatory and why the same cannot be said about argument (2). Hence, they reject van Fraassen's Chevalier story because it makes reference to intentionality, adding new premises to the argument. Nevertheless, the crucial point here is to stress that van Fraassen's argument relies on the claim that asymmetries of explanation are grounded in contextual factors, instead of objective asymmetries within the causal order of the world. Actually, both the Chevalier and the servant responses rely on causal relevance; in the former, once the spot and the height of the tower were established, we can say that the position of the sun causes the fact that the shadow had to be of such a length; in the latter, once we admit that the intention of the Chevalier determined the precise location that the shadow must occupy every setting sun, we can say that the height of the tower is a consequence (or an effect) of that assumption. Although I can concede that van Fraassen did not solve the problem *as* it appears in the D-N discussion, it seems clear that he actually reinterpreted the problem and gave it a proper solution within the pragmatic landscape.

As I mentioned before, van Fraassen regards the theory of why-questions advanced by him as an important part of his whole anti-realist approach to science. According to this view, the sole objective of scientific inquiry is to build models (mathematical or meta-mathematical structures) in order to describe observable phenomena. Therefore, if science provides any explanation at all, this kind of

9 I comprehend the naturalistic aspect of van Fraassen's argumentation as his reference to sciences in order to avoid philosophical difficulties. Hence, the task of defining explanatory relevance is considered a scientific task, not a philosophical one.

information must eventually be identifiable with information about scientific models. Still, assuming a pragmatic account of explanation does not commit one to anti-realism, even if we accept van Fraassen's formalism on why-questions. Peter Achinstein (1984) has already made this point clear by mentioning the famous case of Rutherford's explanation for scattering of alpha and beta particles. In this case, Rutherford explained the observations in terms of the nuclear structure of the atoms involved in the experiment. Achinstein argues that this explanation succeeded because of contextual factors (but not *only* because of them), namely the belief shared by physicists that explanations of this kind of phenomenon must be pursued among descriptions of the microscopic structures of matter. In van Fraassen's formalism, this case could be roughly described as follows: in a context  $K$ , the why-question  $Q =$  "Why does the probabilities of alpha and beta scattering follow a certain distribution  $d$ ?" is properly answered by  $A =$  {a set of statements (or models) describing the internal structures of atom}.<sup>10</sup> Indeed, although the acceptance of  $A$  depends on beliefs shared by physicists, as Achinstein argues, it is perfectly possible to interpret Rutherford's claims realistically, that is to say, as claims concerning the actual structure of the world. To put it in a straightforward way, van Fraassen's pragmatic account does not entail anti-realist commitments, for his formalism does not put any constrain on the interpretation of answers. Furthermore, even if we consider that an explanation is an answer to a why-question which arises in a particular context, it does not preclude us from construing the answers realistically. On the other hand, interpreting an answer realistically is different from interpreting it as context-independent. These points were illustrated by my analysis of the case of both responses (given by the Chevalier and the servant, respectively) concerning "The Tower and the Shadow". Independently of what one understands by causation, the respect-in-which a reason is required when a request for explanation arises cannot be defined *prior* to establishing the context, and that entails that a theory of scientific explanation has to do with pragmatic considerations in order to be satisfactory.

Therefore, embracing a pragmatic account of scientific explanation does not amount to deny scientific realism. Of course, this realist approach to science must incorporate pragmatic-contextual considerations in order to be defensible. As a matter of fact, the goal of sustaining such an approach has received important contributions from pragmatist philosophers, such as C. S. Peirce and J. Hintikka. In particular, the "question-answer model of scientific inquiry" advanced by Hintikka (1981) seems to reinforce the possibility of conciliating scientific explanation and why-questions with realism about scientific inquiry. According to his account, clearly inspired by Kantian philosophy, science is defined as a "series of questions put to nature" (HINTIKKA, 1981, p.70). Nevertheless, the answers obtained by the scientist depend on his background knowledge, which is a contextual factor. Thus, as this background knowledge changes, further questions can be put, as well as new information obtained. Furthermore, background changes would also imply changes to the accepted criteria for evaluating answers. In other words, on this model of scientific investigation, explanations would not be evaluated by static criteria (such as those proposed by typical realists, as Salmon and Kitcher), but the adequacy of

---

10 Naturally, the contrast-class ( $X$ ) could be identified with the set of other possible probability distributions (different from  $d$ ) of scattering.

the criteria would be established along the advancement of the “scientific game” (to use Hintikka’s terminology), though the objective of the whole game remains the same: understanding the real features of our world. Explanation can be conceived, thus, in a realist-pragmatist account.

## Conclusion

In this article, I argued that Kitcher’s and Salmon’s criticism towards van Fraassen’s pragmatic account of explanation relies on misunderstandings concerning the notion of context, for any attempt to define non-pragmatically what kind of information will be counted as relevant ignores the fact that an explanation is essentially a *request for information*. As a request, it will always depend on the questioner’s expectations and on accepted background knowledge. On the other hand, I argued that a pragmatic view of scientific explanation does not commit one to anti-realism about science, though this was the original objective of van Fraassen’s project. Indeed, it can be argued—as I did in section 4—that the formalism advanced in *The Scientific Image* is perfectly compatible with a realist portrayal of scientific inquiry. Van Fraassen’s major contribution to the topic of scientific explanation is to establish that one cannot speak about a coherent theory of explanation without mentioning its irreducible pragmatic dimension.

## References

- ACHINSTEIN, P. The pragmatic character of explanation. *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, v. 2, p. 275-292, 1984.
- DUTRA, L. H. A. *Introdução à teoria da ciência*. 3ª ed. Florianópolis: Ed. da UFSC, 2009.
- HANSON, N. R. *Patterns of discovery*. Cambridge: Cambridge University Press, 1958.
- HEMPEL, C. G. *Aspects of scientific explanation and other essays in the Philosophy of Science*. New York: The Free Press, 1965.
- \_\_\_\_\_. Laws and their role in scientific explanation. In: BOYD, R.; GASPER, P.; TROUT, J. D. *The Philosophy of Science*. MIT Press, 1999, p. 299-315.
- HEMPEL, C. G.; OPPENHEIM, P. Studies in the logic of explanation. *Philosophy of Science*, v. 11, p. 135-175, 1948.
- HINTIKKA, J. On the logic of an interrogative model of scientific inquiry. *Synthese*, v. 47, p. 69-83, 1981.
- KITCHER, P. Explanatory Unification and the causal structure of the world. In: KITCHER, P.; SALMON, W. *Scientific explanation*. Minneapolis: University of Minnesota Press, 1989, p. 410-505.
- \_\_\_\_\_. *The Advancement of science: Science without legend, objectivity without illusions*. New York: Oxford University Press, 1993.

KITCHER, P.; SALMON, W. Van Fraassen on explanation. *The Journal of Philosophy*, v. 84, n. 6, p. 315-330, 1987.

NEWTON, I. *Opticks: or a treatise of the reflections, refractions, inflections and the colours of light*. 3rd. edition. London: William and John Innys, 1721.

PUTNAM, H. *Realism and reason: philosophical papers, volume 3*. Cambridge: Cambridge University Press, 1983.

RICHARDSON, A. Explanation: pragmatics and asymmetry. *Philosophical Studies*, v. 80, p. 109-129, 1995.

SALMON, W. *Causality and explanation*. New York: Oxford University Press, 1998.

\_\_\_\_\_. Four decades of scientific explanation. In: KITCHER, P.; SALMON, W. *Scientific explanation*. Minneapolis: University of Minnesota Press, 1989, p. 1-219.

VAN FRAASSEN, B. C. Salmon on explanation. *The Journal of Philosophy*, v. 82, n. 11, p. 639-651, 1985.

\_\_\_\_\_. *The empirical stance*. New Haven: Yale University Press, 2002.

\_\_\_\_\_. *The scientific image*. Oxford: Clarendon Press, 1980.

### **Endereço/ Address**

Universidade Federal do Paraná, Reitoria  
Rua Dr. Faivre, 405, 6º andar, Ed. D. Pedro II – Centro  
CEP: 80060150 – Curitiba-PR – Brasil

Data de envio: 05-01-16

Data de aprovação: 06-03-16

