

Empiricism, Objectivity, and Explanation

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Wesley Salmon, in his influential and detailed book, *Four Decades of Scientific Explanation*, argues that the pragmatic approach to scientific explanation, “construed as the claim that scientific explanation can be explicated entirely in pragmatic terms” (1989, 185) is inadequate. The specific inadequacy ascribed to a pragmatic account is that objective relevance relations cannot be incorporated into such an account. Salmon relies on the arguments given in Kitcher and Salmon (1987) to ground this objection. He also suggests that Peter Railton’s concepts of the ideal explanatory text and explanatory information (Railton 1981) can provide what the pragmatic approach lacks. This suggestion is not a conclusion of course; we read it as the promotion of part of a research program aimed at forging a greater consensus on scientific explanation—an admirable goal. However, we do not see the pragmatic approach as inadequate. We will show that a synthetic account inspired by Salmon’s adaptation of Railton would be equivalent to van Fraassen’s pragmatic account in three respects: accepting or rejecting requests for explanation; the practice of giving scientific explanations; and the evaluation of the goodness of explanations. We include all three under the general rubric of explanatory “practice.” Admittedly these are not the only three features by which an account of explanation might be evaluated. Roughly, we mean to show that a synthetic account cannot do a better job of accounting for the scientific practices which are of importance to the constructive empiricist, and therefore no argument can be presented to the constructive empiricist to convince her that by her own standards the synthetic account is superior.

Nevertheless, consensus is still possible, for we believe that an account developed along the lines suggested by Salmon can give an equally adequate account of the practice of scientific explanation as well. What distinguishes such an account from a purely pragmatic one is a commitment to a certain conception of objectivity. Though this conception of objectivity is manifested

in the metaphysics of the account, it does not affect the account of explanatory practice. Therefore, advocates of both realism and anti-realism can see that each account of explanation is an adequate description of explanatory practice, and that one's prior commitments alone determine which account will be found more sympathetic. That is also to say that if one wishes to debate the merits of realism and anti-realism, one ought not to look to an account of scientific explanation for knock-down arguments, for one can only find there what one brings to the account to begin with.¹

1. CRITICISMS OF A PRAGMATIC APPROACH TO EXPLANATION (OR: THE INCOMPLETENESS PROOF OF THE PRAGMATIC APPROACH)

Kitcher and Salmon (1987) claim to show that there are serious shortcomings of van Fraassen's pragmatic account of explanation. They focus on the solution that van Fraassen offers for the problem of the "asymmetries of explanation." Briefly, the problem runs as follows. There are cases in which very closely related arguments, equally well supported and equally satisfactory as far as a given account of explanation goes, are perceived to have completely different explanatory value. In van Fraassen's example, the challenge is to distinguish between: (1) the explanation that derives the length of the shadow from the height of the tower; and (2) the explanation that derives the height of the tower from the length of the shadow (1980, 104, 132). The mathematical calculations involved are the same, but, under the usual interpretation, one seems to be an explanation, while the other does not. In addressing the problem of asymmetry in explanation, one is required to explain, in a principled manner, the basis for this distinction.

Van Fraassen's solution is to remind us that explanations are relative to contexts, and what counts as an explanation in one context will not in another. His story of the Tower and the Shadow is designed to demonstrate that, contrary to our usual intuitions, in *that* context, the height of the tower is explained by the length of the shadow (1980, 132). Kitcher and Salmon seem persuaded that this example does describe a context in which a strange explanation can be accepted, but they deny that this approach will solve the "*traditional* problem of asymmetries of explanation" (1987, 316). They believe that the fundamental flaw in van Fraassen's account of explanation is that he has no adequate way to restrict relevance relations. Let us examine how they reach this conclusion.

In van Fraassen's formal framework, a request for explanation is a question Q , characterized as an ordered triple $\langle P_k, X, R \rangle$, where P_k is the topic of the question, X is the contrast class of propositions (including P_k) and R is a relevance relation between propositions and the ordered pair $\langle P_k, X \rangle$. The question can be phrased in quasi-natural language as: Why is it the case that P_k , in contrast to the other members of X , given R ?

First, Kitcher and Salmon note that whether an answer A is relevant "depends solely on the relevance relation R . If A bears R to $\langle P_k, X \rangle$ then A is, by definition, the core of a relevant answer to Q " (1987, 318). They

then claim that van Fraassen “incorporates no relevance requirement on R in the formal characterization” (1987, 318). Finally, Kitcher and Salmon claim to show that “the lack of any constraints on ‘relevance’ relations allows just about anything to count as the answer to just about any question” (1987, 319). Such a conclusion involves a serious misreading of van Fraassen, as has been pointed out by Alan Richardson (1992). We will review briefly just where this misreading occurs, and what consequences it has for the evaluation of a pragmatic account of explanation.

Kitcher and Salmon argue persuasively for the importance of placing restrictions on relevance relations. Without some restrictions we would be committed to the conclusion that “for any pair of true propositions, there is a context in which the first is the (core of the) only explanation of the second” (1987, 319). Hence, some restrictions on relevance relations are necessary. Kitcher and Salmon then investigate what restrictions are offered on van Fraassen’s account, and conclude that, since on van Fraassen’s account only the contrast class of the questioner restricts the relevance relation, “his theory is committed to the result that almost anything can explain almost anything” (1987, 322).

They offer an example intended to support their conclusion. Consider why JFK died on Nov. 22, 1963, where $P_k = \text{JFK died 11/22/63}$, $X = \{\text{JFK died 1/2/63}, \dots, \text{JFK died 12/31/63}\}$, and R is a relation of astral influence. Kitcher and Salmon conclude that an answer may consist in a *true* description of the positions of the stars and planets, and the prediction of JFK’s death may follow from astrological theory.

Kitcher and Salmon claim that van Fraassen must accept such an explanation because he has only subjective limitations on relevance relations. Now, what is wrong with the JFK explanation? Kitcher and Salmon’s diagnosis of the problem is 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” (1987, 322). They claim this to be an example of the crucial deficiency of van Fraassen’s pragmatic account of explanation, and they chide him that he “ought to be equally serious about showing that relevance is not completely determined by subjective factors” (1987, 324). They recommend that “the set of genuine relevance relations may itself be a function of the branch of science and of the stage of its development” (1987, 325).

In summary, Kitcher and Salmon conclude that, since a pragmatic account cannot delineate what ought to count as objective relevance relations, it cannot provide an adequate account of explanation. Salmon relies on this very same argument in his long discussion of the virtues and vices of various theories of explanation (1989).

The problem for Kitcher and Salmon, however, is that, as Alan Richardson has shown, van Fraassen provides much more than purely subjective means for delimiting relevance relations. In fact, van Fraassen has explicitly recognized two restrictions on relevance relations:

Explanatory factors are to be chosen from a range of factors which are (or which the scientific theory lists as) objectively relevant in certain special ways—but . . . the choice is then determined by other factors that vary with the context of the explanation request. To sum up: no factor is explanatorily relevant unless it is scientifically relevant; and among the scientifically relevant factors, context determines explanatorily relevant ones (van Fraassen, 1980, 126).

In other words, there are two levels of delimitation. The background of accepted scientific theories at the time serves to limit what counts as “scientifically relevant”; and, *within those limits*, salience to the interests of the questioner further constrains the *R* relation. Going back to the Kitcher and Salmon example, then, van Fraassen’s view of explanation would *also* reject the JFK question, on the grounds that astrology is not an accepted scientific theory, just as Kitcher and Salmon would (Richardson [1992] gives a careful and full discussion of this point).

Kitcher and Salmon actually quote the crucial part of the above passage in their discussion of this very problem (1987, 324). However, instead of recognizing this as a constraint on requests for explanations, they consider it only on the level of the evaluation of answers. In their article it is clear that Kitcher and Salmon mistakenly believe that van Fraassen cannot reject the JFK question. They further confuse the situation by investigating how answers to the question would be evaluated on van Fraassen’s account. We must stress that it is a basic logical error to criticize van Fraassen’s account of the evaluation of answers to a question, when everyone agrees that that question ought to be rejected, and thus not answered at all. In that misguided criticism, Kitcher and Salmon attribute to van Fraassen the position that the astrological answer to the JFK case can only be rejected if *A* violates the background knowledge *K* (1987, 324). Kitcher and Salmon therefore take themselves to deliver a decisive blow against van Fraassen by pointing out that *A* and *K* are consistent, thereby apparently depriving van Fraassen of any means to criticize the astrological explanations of JFK’s death.

Kitcher and Salmon have missed the role scientific theories play in the rejection of requests for scientific explanation. Their argument involves a clear violation of the logic of van Fraassen’s explicit limitations on relevance relations, quoted above. The JFK-astrology question itself would have been rejected by van Fraassen as being outside the boundaries of objective scientific knowledge.

It may be that Kitcher and Salmon believe that the only reason not to answer a request for scientific explanation is that the question does not *arise* in the given context. At one point in their article they state that “If the question arises in the given context, it is normally appropriate to provide a direct answer” (1987, 318). According to van Fraassen, a *why-question* *Q* *arises* in a context *K* if (1) the background knowledge *K* implies both the topic of the question *P_k* and the falsity of all other members of the contrast class *X*; and (2) *K* does

not imply that all propositions bearing the relevance relation to $\langle P_k, X \rangle$ are false (see 1980, 144–46). To establish by condition (2) that Q does not arise requires a relatively strong position. There may be cases where science has not established this position, and thus a question arises although there is nothing in science to provide an answer to it. Because such an intermediate position is possible, there may be contexts in which a question does arise, though when interpreted as a request for scientific explanation it is inappropriate to provide a direct answer.

Stepping back from the details of the criticism, we can see that Kitcher and Salmon's criticism of a pragmatic account of explanation expresses typical realist concerns. They believe that only *objective* relevance relations can pick out those answers and theories that are *true* (1987, 329). They seem to assume that van Fraassen, because of his empiricism, cannot possibly have or use "objective" relevance relations in his pragmatic account of explanation. The plausibility of that assumption depends on the demand for a strong metaphysical view of objectivity, which will be discussed below.

2. RAILTON AND THE IDEAL EXPLANATORY TEXT

In *Four Decades of Scientific Explanation*, Salmon uses the arguments discussed in the previous section to support his conclusion that a pragmatic account of explanation must be augmented by some account which provides objective relevance relations, such as Peter Railton's (Salmon 1989, 161, 185). Railton does appear to have a metaphysically richer account of scientific explanation. Railton explicitly appeals to the concept of the ideal explanatory text in order to distinguish between correct explanations and merely pragmatically acceptable ones (1981, 243). This distinction will be the focus of our considerations, for it is the basis of Salmon's hope that Railton can supply the means to provide the objectivity which he thinks the pragmatic account lacks. To fix our interpretation of Railton's account, let us examine the role of the ideal explanatory text and of explanatory information in Railton's "Probability, Explanation, and Information" (1981). We will not rehearse the finer details of Railton's presentation, nor of Salmon's summary in his 1989 book.

Railton sees the ideal explanatory text as defining one end of a spectrum of explanatoriness. Railton acknowledges, as everyone must, that the sentences used in the concrete scientific explanations given in practice are terse, abbreviated, and often ambiguous. These features of concrete explanations contrast sharply with the ideals of rigor and exhaustiveness embodied in the deductive-nomological model that Railton and many others view as a paradigmatic formalization of the traditional conception of explanation. Railton's idea is that this contrast arises from the distance between these two types of explanation on a continuum of explanatoriness. To his credit, Railton rejects the simplistic partition of this continuum into classes of "explanations" and "non-explanations":

The answer lies in not drawing lines, at least at this point, and instead recognizing a continuum of explanatoriness. The extreme ends of this

continuum may be characterized as follows. At one end we find what I will call an *ideal D-N-P text*. . . . At the other end we find statements completely devoid of what I will call 'explanatory information' (1981, 240).

To give substance to the intuition that explanatoriness is a matter of degree, Railton introduces the notion of explanatory information.² A candidate explanation is explanatory to the extent that it conveys explanatory information:

Consider an ideal D-N-P text for the explanation of fact *p*. Now consider any statement *S* that, were we ignorant of this text but conversant with the language and concepts employed in it and in *S*, would enable us to answer questions about this text in such a way as to eliminate some degree of uncertainty about what is contained in it. To the extent that *S* enables us to give accurate answers to such questions. . . . we may say that *S provides explanatory information concerning why p* (1981, 240).

We may question the metaphysical commitments of such an account. Of course, there need be no single answer. One may take a fictionalist line on the ideal explanatory text, or one may take a Platonist line (as considered by Salmon, 1989, 194, n. 25). Our suggestion is that, given the work Salmon sees it as doing, the ideal explanatory text be considered as that theoretical entity which dictates the content of the objective statements demanded by our practices of scientific explanation.³ If this is the role of the ideal explanatory text in an account of explanation, we can easily see that the conception of objectivity brought to an account will affect its metaphysical status.

Let us consider how the ideal explanatory text might be seen as the provider of objectivity. It now appears that there is wide agreement that explanations—understood concretely—are to be viewed as tripartite relations involving theories, facts, and question contexts, or what Salmon more carefully calls "salience" (1989, 161). What aspects, then, are abstracted away in the idealization that leads from concrete explanations to ideal explanatory texts?

The obvious answer is—the salient factors. Intuitively, we recognize salient factors as the category of the most particular and specific interest-laden features of an explanatory context that influence the content of concrete explanations. We contrast these with the more general features such as the theories held by conversants and the facts of the explanandum situation. Regarding these two, we can say with confidence that the facts, by their objectivity, are clearly not to be abstracted from. The case of theories requires a more involved investigation.

In one formulation, Railton presents a schema for an ideal text that is tied to a specific theory; this schema includes a theoretical derivation of a probabilistic law (1981, 236). It is natural to presume that if any such text must be in a theoretical language, the idealization to an ideal explanatory text does not abstract from theory. Railton's account is not committed to the strongest version of that conclusion, which holds that an ideal explanatory text is couched in terms of the theories held by the conversants in an explanation.

One could pursue the line that the theories of the ideal explanatory text are themselves idealized entities.⁴ Railton suggests this line when he writes of the “standard context” in which the concepts and terms of an ideal explanatory text are understood (1981, 246), and of different scientific disciplines filling out different portions of the same ideal explanatory text (1981, 247). Such a position includes a stronger conception of the ideal explanatory text, and it opens the possibility that the ideal explanatory text could fit into the framework of the ontic view of explanation which Salmon advocates. Briefly, the ontic view identifies explanations with the states of affairs referred to in concrete explanations, and views the language used in concrete explanations as a necessary, though variable, concession to our linguistic forms of communication (see Salmon 1989, 86).

The alternatives sketched above correspond to various conceptions of objectivity. The advocate of intersubjectivity will be satisfied that the ideal explanatory text is sufficiently objective if it is couched in terms of (or is a part of) scientific theories accepted by the scientific community of which the conversants in an explanation are a part. Those who favor stronger versions of objectivity, such as Salmon, may write their own standards into the characterization of the ideal explanatory text. Even a Platonist could embrace a version of the ideal explanatory text.

We conclude that the ideal explanatory text cannot abstract from theories altogether, though according to advocates of stronger versions of objectivity it need not be couched in terms of the theories actually held by conversants. With the understanding that we do not think that the metaphysics of an ideal explanatory text account of scientific explanation are fixed, we can now proceed to an examination of what the implications for scientific practice are of such an account.

3. THE PRAGMATICS OF EXPLANATION

Salmon embraces the concept of the ideal explanatory text precisely because it is not to be interpreted as ‘subjective’. “The ideal explanatory text contains all of the objective aspects of the explanation; it is not affected by pragmatic considerations. It contains all *relevant* considerations” (1989, 161). Salmon allows that salience is determined by pragmatic factors, but maintains that relevance is an objective relation, and that pragmatics has no role in determining objective relations. Van Fraassen responds that a pragmatic account can include as part of the context of concrete explanations those relations the conversants justifiably accept as objective relations. If the ideal explanatory text is interpreted as included in the theory, or bundle of theories, held by the scientific community of the conversants in an explanation, then a pragmatic account can include that text in the characterization of the general background of theories and knowledge. Railton acknowledges that we must include such an element in a pragmatic characterization of concrete explanations. “Whether in a given context we *regard* a proffered explanation as embodying explanatory information, in light

of the interpretation we impose on it and our epistemic condition generally, is a matter for the pragmatics of explanation" (1981, 243). We want to argue for the stronger position that any influence the ideal explanatory text has on explanatory practice can be captured by the pragmatics of explanation.

Our scientific theories list certain relations as objective, and in our practices of considering requests for scientific explanation, generating scientific explanations, and evaluating scientific explanations, we are required to take those theoretical dictates as compelling. The main point of this section can be stated briefly: not only must we take what our theories say seriously, we have no other means at our disposal to determine what counts as an objective relation.

The advocates of a strong conception of objectivity will still protest that a pragmatic account cannot make the crucial distinction we recognize between scientifically correct explanation and (merely) pragmatically acceptable explanation. We respond that the pragmatic account covers our own practice of explanation as well as that of hypothetical agents. Why do Kitcher and Salmon believe that a request for an astrological explanation of JFK's death ought to be rejected? Because "in the context of twentieth-century science" astral influence does not count as an objective relevance relation (1987, 322). That is just to say that they, two agents who are part of a scientific community holding certain theories and having specific background knowledge, believe that the best scientific theories exclude such relations. Van Fraassen's pragmatic account does not demand that all agents at all times must reject such a request. Indeed, if an agent has no scientific grounds for judging the relation of astral influence to be excluded from the class of objective relations, then by the account that agent ought not to reject the request for explanation.

A pragmatic account does succeed in making sense of a phenomenon all parties recognize, namely that in different contexts the appropriate response to a request for scientific explanation varies with the accepted scientific background theories and factual information of the conversants. Kitcher and Salmon note that there is an assumption in van Fraassen's discussion to the effect that the questioner and the answerer are operating in a common context with a common body of background knowledge K "determined roughly by the state of science at the time" (Kitcher and Salmon 1987, 319). Notice that by the terms of van Fraassen's account, a debate over whether a request for explanation contains an objective relevance relation can occur only if there is some disagreement in the scientific theories accepted by the debaters. Thus what different scientific communities will accept as legitimate requests for scientific explanation may vary as the theories held by those communities vary.

For example, suppose Dick, Jane, and Bill are examining the results of a study on smoking histories and lung cancer. Bill notices that in a certain group of k subjects only one subject, S_k , developed lung cancer. He asks Dick and Jane for an explanation, where his request question is characterized by the following.

- P_k = Subject S_k developed lung cancer
 X = {Subject S_1 developed lung cancer, . . . , Subject S_k developed lung cancer}
 R = smoking history

Jane, a member in a scientific community that holds a biomedical theory which marks smoking history as an objectively relevant factor in the development of lung cancer, accepts the request and gives as an answer "because subject S_k smoked two packs a day for twenty years."

Now imagine that Dick declares, "I firmly believe"⁵ that smoking history is irrelevant to the development of lung cancer." Can he thus reject the request for explanation? We do not yet know. Dick cannot justify his rejection on the grounds that his tarot card reader told him that smoking history is irrelevant to lung cancer. If he has no scientific basis for ruling out R , then the question in this example does *arise*. Dick cannot reject the question because it does not arise, nor because the relevance relation is wildly non-scientific.⁶ At most, he may decline to answer the question on the grounds that his scientific theories give him no answer. That is, he may admit that he does not know the answer. If, on the other hand, he justifiably holds a scientific theory which disagrees with Jane's and marks smoking history as not relevant, then he may justifiably reject the request.

A Salmon-Railton synthetic account cannot explicate the practice of scientific explanation better than van Fraassen's. Even if we view ideal explanatory texts as realist entities we have no *a priori* access to these texts. We have only the current development of empirical science to give us the best explanatory text. This means that the practices of considering requests for scientific explanation, giving scientific explanations, and evaluating the goodness of scientific explanations can be fully explicated by a pragmatic account. If we believe a certain relation, such as astral influence, merits the rejection of a request for explanation, our only justification can be the acceptance of scientific theories which mark those relations as non-existent. Otherwise, the appropriate answer to a request for an astrological explanation is "I don't know." Similarly, when we give scientific explanations, we must look to the theories we accept for guidance on issues of relevance.

Consider finally the evaluation of explanations. On any interpretation of ideal explanatory texts the evaluator of an explanation must look to current scientific theories to determine whether or not something is explanatory information. How do we know when an explanation *correctly* answers questions about the relevant ideal explanatory text? Railton admits that "Not knowing fully what the relevant ideal text looks like, we evidently will be unable in many cases to say how much explanatory information a given proffered explanation carries. But again, it is not the job of an analysis of explanation to settle questions beyond the reach of existing empirical science" (1981, 243). To sum up: how an agent ought to act in these explanatory practices can be fully determined by the information available in the context. Railton, and anyone

else who chooses to embrace the ideal explanatory text, must admit that a pragmatic account can adequately explicate these practices.

4. CONCLUSION

We conclude with a diagnosis of the current situation. There is significant disagreement over what should be demanded of an account of scientific explanation, but all parties agree that it must save the phenomena of explanatory practice. Non-empiricists may of course demand more, but they should not be surprised when empiricists do not demonstrate sympathy for their demands. The debates thereby joined will sound familiar, though to call such debates familiar is not to suggest that they are uninteresting or unimportant. For example, a realist may point out that for a given scientific explanation, facts about the relevant ideal explanatory text give an answer to the question: Why is this explanation scientifically correct? But note that in the eyes of the constructive empiricist this is a suspect why-question. It merits the same treatment that the constructive empiricist gives the demand for an explanation of the regularities observable in nature. The empiricist response to such questions is rejection (see van Fraassen 1980, 203). Moreover, a conception of the ideal explanatory text as something not contained in current accepted theory (whatever the metaphysical status of that something) strongly suggests that the ideal explanatory text is to be discovered. A central aim of constructive empiricism is to emphasize that scientific theories are constructed, and to replace the language of discovery with that of construction wherever possible. The constructive empiricist must therefore reject such a conception of the ideal explanatory text, since it suggests the language of discovery and by her own standards it is useless metaphysical baggage.

Critics of a pragmatic account of scientific explanation have brought an antecedent commitment to some form of metaphysical realism to the analysis of explanation. Given those commitments, they demand a strong notion of objectivity be incorporated in that analysis. Those commitments may also influence what is counted as an adequate analysis. We have demonstrated that due to the constraints on science as a human activity, any synthetic account of explanation designed to import a stronger notion of objectivity into a pragmatic account will be equivalent to van Fraassen's on the practical issues of rejection of explanation requests, giving explanations, and the evaluation of explanations. Realists may still conclude that the empiricist account of explanation is faulty because it lacks the realist conception of objectivity—see for example Philip Kitcher (1989). Similarly, empiricists may conclude that the realist account of explanation is faulty because it involves unnecessary metaphysical commitments, and because it includes notions which make no contribution to saving the phenomena of scientific practice, and which encourage the entrenchment of the language of discovery in an account of theory development.

We find the opposition between the two views to include significant common ground. The pragmatic account insists that objectivity is to be determined

by empirical science. Since theories are held by agents in communities, the actions of those agents ought to be explicated in terms of what the theories they hold say about objective states of affairs. So far there is no quarrel. But the empiricist now declares that since we are able to fully explicate the practice of explanation without appeal to any fuller conception of objective relevance than "something marked by our scientific theories," there is no need for further metaphysical commitments. We suggest that the empiricist is on solid ground so far as scientific explanation is concerned. If the realism–anti-realism controversy is to be resolved, the focus cannot be on the practice of explanation. The different conceptions of objectivity that have been brought to the analyses of explanation are responsible for the difference in the development of accounts of explanation. Better we spend our time examining the deep and long-standing debates over those conceptions directly.

NOTES

1. Peter Railton has offered a similar suggestion in his essay "Explanation and Metaphysical Commitment" (1989, 224).

2. One might question whether or not explanation is a matter of degree, or how the maximum of explanatoriness is to be defined—we believe that the terse statements of a natural language explanation may be counted as fully explanatory in the contexts in which they are requested. Railton is of course free to demand that explanatory information, as a term of art, be defined as quantitative. Railton himself admits that there is no satisfactory account of this notion of information available (1981, 240), and we shall not pursue the prospects for the development of such an account.

3. In Salmon's words, "The ideal explanatory text contains all of the objective aspects of the explanation" (1989, 161).

4. Such as those theories waiting for us at "the end of enquiry."

5. These are Salmon's words used in his justification of the rejection of astral influence as a relevance relation. See (1989, 162).

6. One might argue that in the JFK example the relevance relation of astral influence is simply not a candidate for use in a scientific explanation. We take it that no such argument applies here.

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