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Two pragmatic accounts of factive islands*

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1. Introduction

A question formed by wh-movement from under a factive predicate like *know* is unacceptable if the gapped complement clause denotes uniquely, describing a property that cannot hold of more than one entity (Szabolcsi & Zwarts 1993). This *factive island* (FI) effect is instantiated by (1). (1) contrasts with (2a), where the embedding predicate is not factive, and (2b), where the gapped complement clause does not denote uniquely.[1]

(1) #In which of these towns does Al know that Bach was born?

(2) a. In which of these towns does Al think that Bach was born?
b. In which of these towns does Al know that Bach had relatives?

We will compare two approaches to FIs, dubbed here *contradiction analysis* and *triviality analysis*. The contradiction analysis, due to Abrusán (2011), credits FIs to contradictory presuppositions; under the triviality analysis, sketched in Oshima (2007), FIs suffer from lacking informative answers in any context where they are otherwise felicitous. We argue for the triviality analysis and against the contradiction analysis by arguing that only the former correctly predicts uniqueness to be a necessary ingredient of the FI effect.

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[1] Some speakers do not accept “pied piping” as in (2a) and (2b), hence reject those cases for independent reasons. Also, as noted below, (2b) is expected to carry the presuppositions that Bach had relatives in each of these towns. The concomitant need for presupposition accommodation might be perceived as reduced acceptability of (2b). (2b) nevertheless contrasts with the irreparably deviant (1).

2. Islands by contradiction

Schlenker (2008) and Abrusán (2011) propose that presupposition projection in wh-questions has universal force. For (2b), this predicts, we believe correctly, the presupposition that Bach had relatives in each of these towns. We will refer to the property given by the wh-phrase as **K** and to the property that encodes the presuppositional content given by the factive verb's gapped complement as **P**, so in (2b) we have **K** = λx.λw. x is one of these towns and **P** = λx.λw. Bach had relatives in x in w. Universal projection gives rise to the presupposition in (3). In (1), where **P** = λx.λw. Bach was born in x in w, universal projection yields the contradictory presupposition that Bach was born in each of these towns. Abrusán (2011) proposes that the FI effect is due to contradictory presuppositions arising from factivity, uniqueness, and universal projection.

(3) $\{w: \forall x[\mathbf{K}(x)(w) \rightarrow \mathbf{P}(x)(w)]\}$ universal projection

We add that the contradiction account relies not only on uniqueness of **P**, stated in (4a), but also on plurality of **K**, stated in (4b). In (1), plurality is guaranteed by the content of the wh-phrase, as the property of being one of these towns necessarily holds of more than one entity. Yet the FI effect persists when plurality is not so guaranteed. For example, even though just one town might be circled on our map, *#In which town circled on our map does Al know Bach was born?* is no better than (1). There is evidence, however, that plurality of **K** is a general condition on wh-questions, viz. the unacceptability of wh-phrases like *#Which father of the candidate*, whose content is incompatible with plurality. It is therefore legitimate for the contradiction analysis to take plurality as given.

(4) a. $\{w: |\{x: \mathbf{P}(x)(w)\}| \leq 1\}$ uniqueness
b. $\{w: |\{x: \mathbf{K}(x)(w)\}| > 1\}$ plurality

3. Missing contradictions

Under the contradiction analysis, the FI effect is not expected to depend on uniqueness. The FI effect is expected to arise whenever **P** and **K** instantiate *n-boundedness* and *n-plurality* in (5), which generalize uniqueness (= 1-boundedness) and plurality (= 1-plurality) .

(5) a. $\{w: |\{x: \mathbf{P}(x)(w)\}| \leq n\}$ n-boundedness
b. $\{w: |\{x: \mathbf{K}(x)(w)\}| > n\}$ n-plurality

Consider (6), where **K** = λx.λw. x is one of these 5 Canadians and **P** = λx.λw. x finished in the top 3 in w, so **K** and **P** guarantee 3-boundedness and 3-plurality. The predicted presupposition, that each of the five Canadians finished in the top three, is contradictory. As it stands, then, the contradiction account excludes (6) in the same way as it does (1).

(6) Which of these five Canadians does Al know finished in the top three?

Yet (6) seems usable in suitable contexts and does not seem to suffer from the irreparable deviance attested for (1). (6) is not judged to convey a contradiction, either, hence is consistent with the proposal that the FI effect is due to contradictory presupposition. But this judgment calls for an elaboration of the contradiction account that captures the absence of contradiction in (6) while at the same time leaving predictions for (1) unaltered. Below we consider such an elaboration that suggests itself, but conclude that it is not viable.

4. Tacit domain restriction?

The elaboration in question assumes that the content of a universal presupposition can be weakened as a consequence of tacit restriction of the domain of the wh-phrase. While more familiar from the study of quantificational determiners (e.g. Westerståhl 1985), tacit domain restriction is also attested with wh-phrases. For example, *Which students speak English?* can be interpreted as a question about the students in a particular course. Like quantificational determiners, wh-phrases can in particular be subject to tacit domain restriction by presupposed content.[2] Specifically, rather than denoting the property of being one of the five Canadians, the wh-restrictor in (6) might denote the stronger property of being one of the five Canadians and having finished in the top three, so that $\mathbf{K} = \lambda x.\lambda w.$ x one of these 5 Canadians & $\mathbf{P}(x)(w)$, where again $\mathbf{P} = \lambda x.\lambda w.$ x finished in the top 3 in w. Since the set of those who are among the five Canadians and finished in the top three need not (in fact, cannot) have a cardinality greater than 3, **K** then no longer instantiates 3-plurality, obviating contradiction. So tacit domain restriction might furnish an explanation for the non-contradictory interpretation of (6), without abandoning universal projection in (3).

The question is, of course, why tacit domain restriction would not obviate contradiction, and hence the FI effect, in (1) as well. Suppose that in (1), $\mathbf{K} = \lambda x.\lambda w.$ x is one of these towns & $\mathbf{P}(x)(w)$, where $\mathbf{P} = \lambda x.\lambda w.$ Bach was born in x in w. **K** would then no longer guarantee (1-)plurality, obviating contradiction. However, given that **P** instantiates uniqueness (1-boundedness), the domain restriction in question would of course violate the plurality condition on **K** in (4b) that we proposed as a general felicity condition on wh-questions. So, assuming tacit domain restriction is constrained by the plurality condition, it seems that the contradiction account can indeed capture the contrast between (1) and (6).

While this result is encouraging, we submit that independent diagnostics for tacit domain restriction militate against this solution. In uncontroversial instances of tacit domain restriction, the tacitly restricted content of a wh-phrase can be taken up anaphorically. For example, in response to *Which students speak Spanish?*, the answer *All but Sam* is understood as quantifying over whatever set of students the question is taken to be about, conveying that all of *those* students but Sam speak Spanish. This observation suggests a natural experiment to investigate the presence of tacit domain restriction in (6). Under the hypothesis presently entertained, the wh-restrictor in (6) must be interpreted as describing a set containing only those among these five Canadians who finished in the top three, that is a subset of the five that has at most three members. Accordingly, it should be possible for

[2] We believe that the issues under discussion here are independent of the debate whether tacit domain restriction should be derived through the presupposition projection algorithm itself (van der Sandt 1992) or is due to an independent mechanism (Beaver 2001).

the answer *All but Sam* to make reference to that same set, yielding the contingent meaning that all of its members but Sam are such that Al knows that they finished in the top three. However, such an interpretation of the answer is not actually available. Instead, it only has the (contradictory) interpretation conveying that all of the five Canadians but Sam finished in the top three. We conclude that the wh-phrase domain in (6) cannot actually be restricted in the way that would be required under the proposed elaboration of the contradiction analysis. More broadly, we do not see a way of elaborating the contradiction analysis that lets it capture the contrast between (1) and (6).

5. Islands by triviality

Oshima (2007) offered an alternative account of factive islands, which we dub the *triviality analysis*. Section 5.1 introduces standard assumptions about question interpretation; section 5.2 expounds (our rendition of) the core of the triviality analysis. Its central feature is a non-triviality condition on questions, independently proposed in Simonenko (2015).

5.1 Background on question meaning

In addition to **K** and **P**, the triviality analysis refers to the property **A**, which is given by the non-presuppositional portion of the content of the gapped clause in the scope of the wh-phrase. For (1), repeated as (7), **A** is given by *Al know Bach was born (in)* and has the content shown in (7). For further illustration, we juxtapose the contents of **K**, **P**, and **A** in (1) with the corresponding contents in (2a) and (2b), repeated as (8a) and (8b).

(7) #In which of these towns does Al know that Bach was born? [= (1)]
K = λx.λw. x is one of these towns
P = λx.λw. Bach was born in x in w
A = λx.λw. Al believes in w that Bach was born in x

(8) a. In which of these towns does Al think that Bach was born? [= (2a)]
K = λx.λw. x is one of these towns
P = λx.λw. T (i.e. no presupposition)
A = λx.λw. Al believes in w that Bach was born in x
b. In which of these towns does Al know that Bach had relatives? [= (2b)]
K = λx.λw. x is one of these towns
P = λx.λw. Bach had relatives in x in w
A = λx.λw. Al believes in w that Bach had relatives in x

The triviality analysis assumes a Hamblin/Kartunen (H/K) semantics for wh-questions (Hamblin 1973, Karttunen 1977), under which a question intension maps any possible world to a set of propositions. In terms of **K**, **P**, and **A**, and encoding presuppositions as definedness conditions, a H/K question intension takes the form in (9).

(9) λw.$\{[\lambda v: \mathbf{P}(x)(v).\ \mathbf{A}(x)(v)]: \mathbf{K}(x)(w)\}$ Hamblin/Kartunen semantics

For a concrete illustration, suppose that in a given world w, the set of towns picked out by *these towns* is {a,b}. In that case, (9) determines the extensions of (7), (8a), and (8b) in a world w to be the sets of propositions in (10), (11a), and (11b).

(10) $\left\{ \begin{array}{l} \lambda\text{v: Bach was born in a in v. Al believes in v that Bach was born in a,} \\ \lambda\text{v: Bach was born in b in v. Al believes in v that Bach was born in b} \end{array} \right\}$

(11) a. $\left\{ \begin{array}{l} \lambda\text{v. Al believes in v that Bach was born in a,} \\ \lambda\text{v. Al believes in v that Bach was born in b} \end{array} \right\}$

b. $\left\{ \begin{array}{l} \lambda\text{v: B had relatives in a in v. Al believes in v that B had relatives in a,} \\ \lambda\text{v: B had relatives in b in v. Al believes in v that B had relatives in b} \end{array} \right\}$

We refer to a proposition that is a member of a possible H/K extension of a given question as a *H/K answer*. According to a pervasive intuition (e.g. Karttunen 1977, Abusch 2010), questions carry the presupposition that at least one of their H/K answers is true. The triviality analysis takes this intuition at face value.[3] We encode it in terms of the felicity condition in (12a), a condition on the context set c (Stalnaker 1973) in which a question intension **Q** is used. In terms of **K**, **P**, and **A** in (9), (12a) can be restated as in (12b).

(12) a. $c \subseteq \{w: \exists p[p \in \mathbf{Q}(w) \;\&\; p(w)]\}$ existence presupposition

b. $c \subseteq \{w: \exists x[\mathbf{K}(x)(w) \;\&\; \mathbf{P}(x)(w) \;\&\; \mathbf{A}(x)(w)]\ \}$

According to (12b), for (1) to be felicitous relative to a context set, the context set must entail that one of these towns is a town where Bach was born such that Al believes that Bach was born there. Likewise, a context set in which (2a) is felicitous must entail that one of these towns is such that Al believes that Bach was born there; and a context set in which (2b) is felicitous must entail that one of these towns is a town where Bach had relatives such that Al believes that Bach had relatives there.

Note that the existence presupposition posited above is inherent to the question, rather than being due to a presupposition trigger the question contains, such as a factive predicate. As for the latter, note that the evidence about projection in wh-questions presented so far is mixed. One the one hand, we took intuitions about (2b) to indicate that there the factive presupposition projects universally; on the other hand, the fact that (6) is not judged contradictory suggests that there universal projection is not in effect there. Accordingly, qualifying the generalizations proposed in Schlenker (2008) and Abrusán (2011), we take presuppositions in wh-questions to project universally by default, but we propose that such universal projection is suspended if it would result in a pragmatically deviant meaning such as a contradiction. In such cases, presupposition projection only proceeds up to the level of H/K answers, whose presuppositional content is encoded by the property **P** in (9).

[3] Oshima (2007:152) writes "It is generally believed that a wh-interrogative presupposes that it has at least one true resolution; I too take this view, although it can be a matter of debate."

5.2 Non-triviality in the interpretation of questions

Spelling out proposals in Oshima (2007) and Simonenko (2015), we now introduce the key ingredient of the triviality analysis, a felicity condition on question use that we refer to as *non-triviality* condition. In a nutshell, this condition imposes the (pragmatically natural) requirement that a question have a felicitous and informative answer. More precisely, it requires that the context c do not already entail the truth of all possible H/K answers in c whose presupposition c satisfies. The non-triviality condition can be spelled out as in (13a). In terms of the format in (9), it can be restated as in (13b).[4]

(13) a. $c \nsubseteq \{w: \forall p[p \in \mathbf{Q}(w) \ \&\ c \subseteq \mathrm{dom}(p) \rightarrow c \subseteq p]\}$ non-triviality

b. $c \nsubseteq \{w: \forall x[\mathbf{K}(x)(w) \ \&\ c \subseteq \mathbf{P}(x) \rightarrow c \subseteq \mathbf{A}(x)]\}$

So for a question intension of the form (9) and a given context set to meet this condition, there must be some counterexample to triviality: some world w in the context set and some individual x such that **K**(x)(w) and such that the context set entails **P**(x) but not **A**(x).

Before applying this condition to the analysis of FIs, we will illustrate its effect abstractly with reference to a few "toy" context sets. For any X, Y, Z, let $w_{X,Y,Z}$ be a possible world w such that {x: **K**(x)(w)} = X, {x: **P**(x)(w)} = Y, and {x: **A**(x)(w)} = Z. Consider now the context set in (14), which is comprised of just two worlds.

(14) $c = \left\{ \begin{array}{l} w_{\{a,\,b\},\,\{a\},\,\{a\}} \\ w_{\{a,\,b\},\,\{a\},\,\{b\}} \end{array} \right\}$

In this context set, the question intension in (9) is non-trivial, i.e. the context set and (9) meet the non-triviality condition. This is because **K**(a) is true in some context set world (in fact both of them) and this fact extends into a counterexample to triviality: the context set entails **P**(a) but not **A**(a). In contrast, the question intension (9) is trivial in both of the context sets in (15).

(15) a. $c = \left\{ \begin{array}{l} w_{\{a,\,b\},\,\{a\},\,\{a\}} \\ w_{\{a,\,b\},\,\{a\},\,\{a,\,b\}} \end{array} \right\}$

b. $c = \left\{ w_{\{a,\,b\},\,\{a\},\,\{a\}} \right\}$

The reason for triviality is the same in the two cases in (15). Both **K**(a) and **K**(b) are true in some context set world (in fact both of them), but neither case extends into a counterexample to triviality: the context set does not entail **P**(b) to begin with; and while it does entail **P**(a), it entails **A**(a) as well. Finally, consider the context set in (16).

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[4] In (13a), dom(p) is the set of worlds that serves as the domain of the propositional function p, and that thereby encodes the presuppositional content of p. "c⊆p" is short for "c⊆{w: p(w)}", and likewise for other set theoretic statements.

(16) $\quad c = \left\{ \begin{array}{l} w_{\{a,\, b\},\, \{a\},\, \{a\}} \\ w_{\{a,\, b\},\, \{b\},\, \{b\}} \end{array} \right\}$

Again both **K**(a) and **K**(b) are true in some context set world (in fact both of them), but neither case extends into a counterexample to triviality, in this case simply because the context set fails to entails either **P**(a) or **P**(b) in the first place.

5.3 Non-triviality and factive islands

As noted, the FI case in (1) is distinguished from acceptable cases like (2a) and (2b) in that it involves a property **P** that is necessarily true of at most one individual. This uniqueness of **P**, too, can be stated as an assumption about the context set, as in (17).

(17) $\quad c \subseteq \{w\colon |\{x\colon \mathbf{P}(x)(w)\}| \leq 1\}$ uniqueness

It can now be shown that the existence presupposition (12b) and the non-triviality condition (13b) taken together are logically inconsistent with the uniqueness requirement in (17). There is no logically possible context set that satisfies all three conditions. Following Oshima (2007), then, our proposal is that FI questions like (1) are unacceptable by virtue of being infelicitous in all possible contexts. Put differently, in FI cases, any context set that otherwise meets the requirements on the felicity of the question, entailing uniqueness and the existence presupposition, will violate the non-triviality condition.

It remains to be established that the three conditions are indeed logically inconsistent. To begin, it is worth noting that the findings reported above about the toy context sets in (14) to (16) are aligned with the claim. By design, all of the context sets given there meet the uniqueness condition, but each of them violates either the existence presupposition or the non-triviality condition. As discussed above, the contexts in (15) and (16) violate the non-triviality condition. And while (14) meets the non-triviality condition, it fails to satisfy the existence presupposition: in one of the worlds in that context set, there is no overlap between the sets determined by **P** and **A**.

More generally, if a context allows for only one felicitous answer (due to uniqueness) but also guarantees that some answer is true (due to the existence presupposition), then that context is guaranteed to already entail the truth of that unique felicitous answer, in violation of non-triviality. More formally, the claim that uniqueness, the existence presupposition, and non-triviality are inconsistent can be established by proving the pair of transparently contradictory consequences in (18).[5]

(18) a. $c \subseteq \{w\colon \mathbf{A}(\iota y.\mathbf{P}(y)(w))(w)\}$ from uniqueness, existence presupposition
b. $c \nsubseteq \{w\colon \mathbf{A}(\iota y.\mathbf{P}(y)(w))(w)\}$ from uniqueness, non-triviality

[5] The proof of the fact in (18a) is obvious and left to the reader. (18b) can be established through a sequence of more immediately obvious consequences: (13b) entails $\exists w{\in}c[\neg\forall x[\mathbf{K}(x)(w) \;\&\; c{\subseteq}\mathbf{P}(x) \rightarrow c{\subseteq}\mathbf{A}(x)]]$, which entails $\exists w{\in}c\exists x[\mathbf{K}(x)(w) \;\&\; c{\subseteq}\mathbf{P}(x) \;\&\; c{\nsubseteq}\mathbf{A}(x)]$, which entails $\exists x[c{\subseteq}\mathbf{P}(x) \;\&\; c{\nsubseteq}\mathbf{A}(x)]$, which in conjunction with the uniqueness assumption in (17) entails $c \nsubseteq \{w\colon \mathbf{A}(\iota y.\mathbf{P}(y)(w))(w)\}$, the consequence stated in (18b).

What is important in view of the characteristics of the FI phenomenon established in the beginning, an inconsistency of the existence presupposition and the non-triviality condition only arises on conjunction with the uniqueness assumption. That is, the existence presupposition and the non-triviality condition by themselves are logically consistent. This can be established with a simple toy context set such as (19), which relative to (9) satisfies both the existence presupposition and the non-triviality condition: the existence presupposition is satisfied because the sets determined by **K**, **P** and **A** overlap in each context set world; and non-triviality is satisfied because **P**(a) is true in each context set world, but **A**(a) is not.

(19) $$c = \left\{ \begin{array}{l} w_{\{a, b\}, \{a\}, \{a\}} \\ w_{\{a, b\}, \{a,b\}, \{b\}} \end{array} \right\}$$

This means that, like the contradiction account, the triviality analysis accounts for the contrast between the FI case in (1) and the minimally different acceptable case in (2b), where uniqueness of **P** is not guaranteed. Crucially, the triviality analysis also captures the contrast between (1) and (6), which we argued to be beyond the reach of the contradiction account. (6) is repeated in (20), annotated with the three relevant properties.

(20) Which of these five Canadians does Al know finished in the top three? [= (6)]
K = λx.λw. x is one of these 5 Canadians
P = λx.λw. x finished in the top 3 in w
A = λx.λw. Al believes in w that x finished in the top 3

This question, too, is correctly permitted as acceptable because it does not require uniqueness of **P**. As a consequence, there are context sets in which the account allows for the question to be felicitous. One such context set is specified in (21), which minimally adjusts (19) in terms of the cardinality of the set determined by **K**. Once again, the existence presupposition is satisfied by this context set because the sets determined by **K**, **P** and **A** overlap in each context set world; and non-triviality is satisfied because **P**(a) is true in each context set world, but **A**(a) is not.

(21) $$c = \left\{ \begin{array}{l} w_{\{a, b, c, d, e\}, \{a\}, \{a\}} \\ w_{\{a, b, c, d, e\}, \{a, b\}, \{b\}} \end{array} \right\}$$

Under the triviality analysis, then, the FI effect arises in questions that are infelicitous in all possible contexts, due to inconsistent requirements on the context set. In FI cases, due to the uniqueness entailed by the content of the factive presupposition, any context that otherwise meets the requirements on the felicity of the question, entailing uniqueness and the existence presupposition, will violate the non-triviality condition. In the absence of uniqueness, felicity conditions are satisfiable and, as intended, no unacceptability is predicted. The triviality analysis thereby improves on the contradiction account, which was seen to incorrectly exclude cases like (6) despite the absence of uniqueness.

6. Conclusion

We have spelled out Oshima's (2007) triviality analysis of FIs and we have offered an empirical argument for this analysis over Abrusán's (2011) contradiction analysis. In FI cases, the non-triviality condition conspires with uniqueness and the existence presupposition to impose an inconsistent requirement on the context set. We conclude by drawing attention to another island effect where the non-triviality condition can be argued to contribute to inconsistency, and by identifying an open question introduced by the triviality analysis.

Simonenko (2015) analyzes unacceptable *referential island* cases like (22), where wh-movement originates within a complex demonstrative.[6]

(22) #Which composer did you invite that friend of?

Building on Schwarz (2009), Simonenko proposes an account under which **A** is a constant function on the individual argument in (22): for a given individual f, $\mathbf{A} = \lambda x.\lambda w.$ you admire f in w. This guarantees that all propositions in the H/K extension have the same truth value, ensuring that any context set c meets the *constancy* condition in (23).

(23) $c \subseteq \{w: \{x: \mathbf{A}(x)(w)\} = \emptyset \vee \{x: \mathbf{A}(x)(w)\} = D\}$ constancy

In conjunction with the question's existence presupposition, constancy entails $c \subseteq \{w: \{x: \mathbf{A}(x)(w)\} = D\}$, which transparently contradicts non-triviality. Simonenko credits the referential island effect to this inconsistency. In this account of referential islands, then, non-triviality plays much the same role that it does under the triviality analysis of FIs, an observation that we propose furnishes independent motivation for the latter.

However, despite converging evidence for the utility of a non-triviality condition in the analysis of questions, it is incumbent on us to also report on a blatantly incorrect prediction of the analysis as stated so far. In the question in (24), **A** is the property $\lambda x.\lambda w.$ x's height $\geq$ x's height, which maps any possible individual to a tautology. This ensures without any further assumptions that any H/K answer is entailed by any context set, hence it ensures that (24) violates the non-triviality condition in all possible contexts.

(24) Which of the boys is as tall as himself?

Without further assumptions, then, (24) is predicted to be on a par with FI cases and referential island cases. Just like (1) and (22), (24) is predicted to necessarily violate a felicity condition. Hence (24) is predicted be no more acceptable than (1) or (22). This prediction is clearly incorrect. Far from sharing the unacceptability of FI cases and referential island cases, (24) is judged to be a fully acceptable, though rhetorical, question, much like *John is as tall is himself* is judged to be a fully acceptable, though trivial, assertion.

[6]Simonenko does not actually focus on English data, but instead analyzes who-extraction from weak and strong definites in Austro-Bavarian. Strong definites give rise to much the same pattern as demonstratives in English, which we focus on here for ease of exposition.

We propose to reconcile the acceptability of (24) with the proposed accounts of FIs and referential islands by refining assumptions about the relation between question meaning and acceptability. We speculate that infelicity in all possible context sets results in unacceptability only if this necessary infelicity arises from the inconsistency of more than one felicity condition. By hypothesis, necessary infelicity of FIs and referential islands only arises from the conjunction of the existence presupposition and non-triviality. In contrast, predicted necessary infelicity of acceptable, rhetorical, questions like (24) is due to a violation of non-triviality alone.

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