*Pragmatic Encroachment on Scientific Knowledge?*

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**1: Introduction.**

Pragmatic encroachment theories of knowledge may be characterized as views according to which practical factors may partly determine the truth-value of ascriptions that S knows that *p* – even though these factors do not partly determine S’s belief that *p* or *p* itself. The pros and cons of variations of pragmatic encroachment are widely discussed in epistemology. But despite a long pragmatist tradition in the philosophy of science, few efforts have been devoted to relate this particular view to issues in philosophy of science.[[1]](#footnote-1) Consequently, a central aim of the present paper is to consider how the contemporary debates over pragmatic encroachment connect to philosophy of science. Here is the plot:

In **Section 2**, I provide a general characterization of pragmatic encroachment theories and restrict the discussion to one branch of it.

In **Section 3**, I compare and contrast scientific and non-scientific knowledge and note some *trademark features* of scientific knowledge that will be relevant for the subsequent discussion.

In **Section 4**, I move from exposition to argument by presenting some cases that challenge pragmatic encroachment on scientific knowledge.

In **Section 5**, I argue that a general argument contra pragmatic encroachment theories extends to compromise pragmatic encroachment accounts of scientific knowledge.

In **Section 6**, I consider whether my arguments against pragmatic encroachment may be rebutted by embedding pragmatic encroachment in the anti-realist framework of constructive empiricism.

In **Section 7**, I conclude by arguing that the challenges for pragmatic encroachment on scientific knowledge are grave and that they cast doubt on pragmatic encroachment generally.

**2: Pragmatic encroachment characterized.** Pragmatic encroachment theories come in many forms and shapes. Some of them are metaphysical theories according to which knowledge itself is sensitive to practical factors of, for example, the subject’s situation (Hawthorne 2004; Stanley 2005; Fantl and McGrath 2009). Other brands of pragmatic encroachment are semantic theories which claim that practical factors may impact the truth-conditions of knowledge ascriptions. While I will focus on the metaphysical variety, it is worth noting a general characterization (Gerken 2017, Ch. 3.1 for elaboration).

As a general approximation, pragmatic encroachment is the view that knowledge or the truth of knowledge ascriptions depends in part on practical factors and not merely on the subject’s beliefs, evidence, epistemic environment and other factors that are, in DeRose’s term ‘truth-relevant’ (DeRose 2009: 24, Fantl and McGrath 2009: 178).

Pragmatic encroachment goes beyond the view that practical factors may defeat knowledge by defeating belief. In general, the view goes beyond cases in which practical factors undermine enabling conditions for S’s knowledge – for example, by causing the non-existence of S, the truth of the complement clause etc. The relevant epistemological claim is that someone who continues to believe may cease to know in virtue of a change in (salient) practical factors.

I use the phrase ‘knowledge ascriptions’ and its cognates as shorthand for ‘assertive utterances of sentences of the form ‘S knows that *p*.’ Given this terminology, we can state a biconditional that characterizes the core of *pragmatic encroachment about knowledge or ‘knowledge’* (henceforth PEAK):

**PEAK**

The true theory of knowledge or ‘knowledge’ is a pragmatic encroachment theory if and only if practical factors may partly determine the truth-value of ascriptions that S knows that *p* – even though they do not partly determine S’s belief that *p* or *p* itself.

Pragmatic encroachers uphold the right-hand-side of PEAK. Those who reject it are called *strict purists*. Because PEAK’s right-hand-side is articulated in terms of truth-values of knowledge ascriptions, it allows for importantly different species of pragmatic encroachers. Pragmatic encroachers may be *metaphysical impurists* and take knowledge itself to be partly, although indirectly, determined by practical factors. Or they may be *semantic impurists* and take the truth-conditions or truth-values of ‘S knows that *p*’ to be partly determined by practical factors.[[2]](#footnote-2) Consequently, the left-hand side of PEAK is a disjunction since a pragmatic encroacher may either uphold a brand of metaphysical impurism (e.g., interest-relative invariantism) or a brand of semantic impurism (e.g., contextualism or relativism). Thus, ‘pragmatic encroachment’ is a generic label for the family of theories that accept the right-hand side of PEAK. But, as noted, pragmatic encroachment theorists differ radically in their explanations of *why* the right-hand side of PEAK is true.

PEAK is more *inclusive* than Stanley’s Interest-Relative Invariantism (IRI): “…whether or not someone knows that *p* may be determined in part by practical facts about the subject’s environment” (Stanley 2005: 85). This characterization excludes brands of pragmatic encroachment according to which the relevant practical interests are those of someone other than the subject – e.g., the speaker, hearer, community or evaluator. PEAK is broader since it does not involve requirements pertaining to *whom* the practical factors concern and, as we shall see, this may be an advantage for an extension of the view to scientific knowledge. Moreover, IRI is more restrictive in virtue of being a thesis about knowledge itself, whereas PEAK’s right-hand side is compatible with both metaphysical and semantic impurism. Since PEAK is articulated in terms of the truth-*values* of knowledge ascriptions, it allows that the *theoretical explanation* of the alleged truth-value variance turns on the view that knowledge itself is sensitive to practical factors or on the view that ‘knows’ is semantically sensitive to practical factors.

However, while pragmatic encroachment should be characterized in this broad and inclusive manner, I will focus on pragmatic encroachment of the brand that subscribes to *metaphysical* impurism.[[3]](#footnote-3)

**3: Non-scientific and scientific knowledge.** Since scientific knowledge is a distinctive and important kind of knowledge, it is important to consider whether a pragmatic encroachment theory is plausible of it. Moreover, there are long-standing debates about pragmatism in the philosophy of science (for recent surveys, see Almeder 2007; Kitcher 2012).

To see how debates and theories concerning ordinary knowledge bear on scientific knowledge, we must gain some clarity about their relationship. Of course, this task is complicated by the fact that we do not have an adequate theory of either non-scientific or scientific knowledge. Indeed, the issue of how to distinguish scientific from non-scientific knowledge is not as intensely discussed as the traditional problem of demarcation: The issue concerning how to distinguish science from non-science and, in particular, pseudo-science (Popper 1934/2002; Lakatos 1981; Laudan 1983; Pigliucci and Boudry 2013). However, it is nevertheless possible to pursue some paradigmatic, albeit defeasible, trademarks of scientific and ordinary knowledge, respectively (see also Hoyningen-Huene 2013; Bird *forthcoming*).

Perhaps the overarching ideal or characteristic of scientific knowledge is that of objectivity. However, it is not clear that the ideal of objectivity may serve as a particularly useful trademark of scientific knowledge. One reason for this is that the ideal is extremely broad and abstract. So, without further specification, it fails to dissociate scientific knowledge from many kinds of ordinary knowledge. Consequently, I will explicate some of the more concrete trademarks of scientific knowledge that exemplify the ideal of objectivity in a more concrete manner.

Following previous work, I will focus on the difference in the *kind* of warrant characteristic of scientific and non-scientific knowledge, respectively (Gerken 2015). I assume pluralism about epistemic warrant in the sense that I assume that a belief may be both justified – i.e., internalistically warranted – and entitled – i.e., externalistically warranted.[[4]](#footnote-4) It is debated how to draw internalist/externalism (justification/entitlement) distinction. Here I assume that that justification depends on the faculty of reason whereas entitlement does not (I argue for this conception in Gerken forthcoming a). Thus, warrants by perception, memory and testimony are typically entitlements. In contrast, warrants by reasoning and understanding are typically justifications.

Importantly, there are a number of subspecies of justification. For example, accessibilist justification is roughly a warrant that may be reflectively accessed by first-person method. A subspecies of it is *discursive* *justification* that is, roughly, a warrant that may be *articulated* by the justified individual (Gerken 2012, forthcoming a). This requires but goes beyond first-personal accessibility and is, I suggest, characteristic of scientific warrant. A famous proclamation by Lord Kelvin is illustrative here:

When you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be. (Kelvin 1883).

Kelvin’s proclamation centers on the importance of numerical measurement. But its broader emphasis is the significance of the ability to express one’s grounds for a scientific hypothesis and this is what discursive justification concerns. Science has become an extremely collaborative affair (Hardwig 1985; Wray 2002; Winsberg *et al*. 2014; Kitcher 1993; Boyer-Kassem, Mayo-Wilson and Weisberg 2017). Indeed, scientific knowledge is often thought to be characteristically collective knowledge (Wray 2001; Fagan 2012; de Ridder 2014). In consequence, scientists must typically be able to articulate the epistemic reasons for accepting a hypothesis or theory. That is, since science is characteristically collaborative and collective, scientific acceptance characteristically requires an internalist species of warrant – discursive justification.

Elsewhere, I have argued that discursive justification is critical in intra-scientific testimony (Gerken 2013, 2015). Thus, I will consider discursive justification as a kind of warrant that is *characteristic of* scientific knowledge although it may not be strictly required for it. Thus, one trademark of scientific knowledge is the following:

**Trademark 1**

*Scientific knowledge is typically backed by internalist warrants such as, paradigmatically, discursive justification whereas non-scientific knowledge is very frequently only backed by externalist warrant (i.e., by various forms of epistemic entitlement).*

Given that scientific knowledge is typically backed by the discursive warrants through a highly systematic process, there is a sense in which it is harder to acquire. Even in cases where non-scientific knowledge is more reliable than scientific knowledge, scientific knowledge may be harder to acquire. This will be case insofar as systematization marks a central difference between ordinary and scientific knowledge. For example, here is Hoyningen-Huene’s *central thesis*: *Scientific knowledge differs from other kinds of knowledge, in particular from everyday knowledge, primarily by being more systematic.*” Hoyningen-Huene 2013: 15. See also Bird forthcoming).[[5]](#footnote-5) The assumption that scientific knowledge is highly systematic is connected to the *Trademark 1* in at least two ways. Firstly, because providing discursive justification tends to require a systematic effort in, for example, data collection and analysis and secondly because systematic knowledge requires discursive justification: “…the defense of knowledge claims is an absolutely indispensable dimension in science’s systematicity” (Hoyningen-Huene 2013: 89).

Thus, an important consequence of the systematic character and the special discursive requirements on scientific knowledge is that it is characteristically more demanding to acquire than ordinary knowledge. We may state this as another trademark of scientific knowledge.

**Trademark 2**

*Scientific knowledge is typically more demanding to acquire than non-scientific knowledge.*

Reflection on the scientific ideals of intersubjective replicability and accountability provide further reasons why scientific knowledge is standardly harder to acquire than non-scientific knowledge. The ideal of intersubjective replicability as a key mark of scientific has a long history. Popper provides a clear statement: “the objectivity of scientific statements lies in the fact that they can be inter-subjectively tested” (Popper 1934/2002: 22).

Because scientific knowledge should be replicable where possible, scientists are accountable for setting forth only well-warranted claims in a manner that explicating the warrant as clearly as possible (Kahneman 2012; Winsberg et al. 2014; Gerken 2015). Indeed, part of scientific practice is to present evidence and methodology in accordance with established protocols of one’s discipline. So, we may note this as a further contrast between scientific and non-scientific knowledge.

**Trademark 3**

*Scientific knowledge is typically intersubjectively replicable whereas ordinary knowledge is frequently not.*

As mentioned, these trademarks may not amount to necessary conditions on scientific knowledge and they are certainly not individually or jointly sufficient for it. Nevertheless, they reflect commonplace characterizations of scientific knowledge that may help illuminate how arguments for and against pragmatic encroachment on non-scientific knowledge bear on scientific knowledge. Consider, for example, Hansson’s encyclopedia discussion of demarcation criteria which concludes: *“*Science is a systematic search for knowledge whose validity does not depend on the particular individual but is open for anyone to check or rediscover” (Hansson 2014).

Although the specifics of Hansson’s statement may be challenged, it reflects a commitment to an ideal of replicability that is very widely accepted in the philosophy of science. Note also that this commitment, articulated as Trademark 3 is closely related to Trademarks 1and 2. For example, replicability tends to require that the justification (such as the data and methodology) for a scientific hypothesis is articulated Trademark 1 which in turn helps to explain why scientific knowledge is particularly demanding to acquire Trademark 2.[[6]](#footnote-6)

**4: Challenges for pragmatic encroachment about scientific knowledge.** A lot of challenges have been raised against pragmatic encroachment theories and, especially, against varieties of metaphysical impurism. In this section, I begin with two cases that target pragmatic encroachment on scientific knowledge specifically. I think that the cases have some force considered on their own. But they are strengthened by reflection on the trademarks of scientific knowledge sketched above.

**4a: Basic cases.** Let us consider two cases of stakes variation that should make life uncomfortable for pragmatic encroachers about scientific knowledge.

**4.a.i:** **Personal stakes variation.** The first case that I will consider is one in which two scientists have gathered the exact same amount of evidence for accepting the hypothesis that *p* although it is extremely important for one scientist but not for the other.

***PERSONAL STAKES VARIATION***

Seana has just finished her PhD and she is now applying for academic positions. Unfortunately, her skills are hard to transfer. So, if she does not get an academic position, it will take her years to find a job that will enable her to pay off her significant loans. Seana has gathered very substantive evidence for *p* and now believes that it is true. So, she considers making *p* the central hypothesis in her applications since this would strengthen them. However, she is aware that if *p* turns out to be false, it will eventually be held against her that she made it central and this would likely mean the end of her academic career. As a matter of fact, *p* is true.

Sean is a full professor late in his career who is now planning to retire. Fortunately, he has saved up for retirement. So, he simply looks forward to finishing his projects in a timely manner. However, he has come across the hypothesis that *p* which he thinks would be fun to investigate. Sean has gathered very substantive evidence for *p* and now believes that it is true. He considers making *p* central in a public lecture instead of merely covering old material. Moreover, he is aware that if *p* turns out to be false, it would not be held against him or have negative consequences for him given that he is close to retirement. As a matter of fact, *p* is true.

Since the stakes associated with *p* are considerably higher for Seana than for Sean, a prominent metaphysical brand of pragmatic encroachment will have it that Seana does not know whereas Sean does. This brand of pragmatic encroachment is one that upholds *subject*-sensitivity according to which it is the practical factors relevant to the subject of a knowledge ascription that partly determines whether she knows. For example, the stakes for Seana are so high that she cannot rationally act on *p* whereas Sean can rationally act on *p* (Hawthorne 2004; Stanley 2005; Fantl and McGrath 2009). However, in the context of a scientific investigation, this assumption appears perhaps even more problematic than in the case of ordinary knowledge. For example, it clashes with *Trademark 3* that scientific knowledge should be intersubjectively replicable. Assume, for the sake of the argument, that we ascribe Sean scientific knowledge that *p* on the basis of *n* trials of some experiment. On a natural understanding of ‘intersubjective replicability’ in *Trademark 3*, any other scientist running *n* trials of the same type of experiment should also be able to acquire scientific knowledge that *p* on this basis. But according to the version of pragmatic encroachment in question, Seana would not be able to replicate Sean’s scientific knowledge by way of *n* trials of the relevant experiment.

This diagnosis runs counter to the overarching idea of scientific objectivity. At least, rejecting this runs at the risk of compromising *Trademark 3* according to which scientific knowledge is intersubjectively replicable. More generally, the assumption that subjective stakes are partial determiners of scientific knowledge clashes with the overarching scientific ideal of objectivity.

The case does not make for a knock-down-drag-out argument. For example, it does not show that *no* kinds of practical factors affect the truth-values of knowledge ascriptions.[[7]](#footnote-7) On the other hand, it suggests that in a very central case type pragmatic encroachers are committed to a problematic consequence given the trademarks of scientific knowledge. Consequently, the case puts pressure on the idea that subjective stakes partly determine whether the subject has acquired scientific knowledge. So, it exemplifies my strategy of abductively compromising pragmatic encroachment from various angles. To this end, let us consider another variety of stakes variation.

**4.a.ii. General stakes variation.** Another stakes variation case may reinforce the pressure on pragmatic encroachment on scientific knowledge form another angle. Moreover, this case is more robust against certain responses than the case considered above.

***GENERAL STAKES VARIATION***

A scientific hypothesis, H, rests on a set of extraordinarily well warranted propositions, E, and the specific proposition, *p.* H is extremely important insofar as public policy issues which will affect the lives and deaths of millions of people hinge on whether H is true or false. Consequently, the scientific community has investigated the basis for H and have acquired a compelling set of evidence, E, for *p*. Now most scientists believe that *p* is true and accept H.

A scientific hypothesis H\*, rests on a set of extraordinarily well warranted propositions, E\*, and the specific proposition, *p*. H\* is not important since no public policies are related to H\* and nothing of any practical importance seems to hinge on whether *p* is true or false. Nevertheless, the scientific community has investigated the basis for H\* and have acquired a compelling set of evidence, E, for *p*. Now most scientists believe that *p* is true and accept H\*.

Since the general stakes associated with H are higher than those associated with H\*, pragmatic encroachers who are metaphysical impurists appear to be committed to the following assumption: The scientists investigating H do not know that *p* on the basis of E whereas the scientists investigating H\* know that *p* on the basis of E.

Again, this assumption is in *prima facie* conflict with the scientific ideal of objectivity. More specifically, it does not appear to cohere very well with *Trademark 3*, the ideal of replicability. According to the brand of pragmatic encroachment under consideration, the scientists investigating the low-stakes hypothesis, H\*, have scientific knowledge that *p*. So, it seems odd to deny that they have successfully replicated the scientific knowledge that *p*. But the group of scientists investigating the high-stakes hypothesis, H, do not have scientific knowledge that *p*. So, it is not possible to replicate it.

Consider now the scientists investigating the high-stakes hypothesis, H, who are said to lack scientific knowledge that *p*. Given this assumption, they cannot have replicated the knowledge that *p* acquired by the scientists investigating the low-stakes hypothesis, H\*. But this seems odd since they have obtained type-identical evidence for *p* as the other group of scientists. Perhaps pragmatic encroachers are willing to bite these bullets or perhaps there is another way out of this conundrum. But the onus is on the pragmatic encroachers to show the way.

Further problems arise once we consider the relationship between scientific knowledge and ordinary knowledge. Consider, for example, the following case:

***LAY HIGH/SCI LOW***

The owner of a dive center, S, is taking a marine biologist, S\*, on a tour of a local reef. During the dive, they see a number of white corals and both form the belief that the reef is beginning to suffer from coral bleaching (henceforth *p*).[[8]](#footnote-8)

If the reef is bleaching, this will have disastrous consequences for S who owns a dive center and whose livelihood depends on a healthy reef. Consequently, S includes the statement that the reef is beginning to suffer from coral bleaching in one of her letters to a local newspaper of the area.

If the reef is bleaching, it will not have any consequences for S\* and would not be a discovery of any significance in S\*’s scientific community. Nevertheless, S\* includes the statement that the reef is beginning to suffer from coral bleaching in one of her scientific articles in a marine biology journal.

In this case, the type of pragmatic encroachment under consideration will have it that the layperson, S, in high stakes does not know that the reef is beginning to suffer from coral bleaching whereas the scientist, S\*, in low stakes does know. However, they both have the exact same evidence and that it is evidence of a type (unsystematic visual perception) that may be assessed without scientific expertise. So, it appears problematic to ascribe scientific knowledge to S\* and deny that S possesses ordinary knowledge. The *Trademarks 1* and *2* reinforce the impression that S\* should not be ascribed scientific knowledge on the basis of unsystematic perceptual evidence in cases where ordinary knowledge (on the basis of such evidence) is denied.

According to *Trademark 1*,scientific knowledge typically requires *discursive justification* of which S\* has very little. Indeed, it would seem that for us to ascribe scientific knowledge to S\* that the reef is bleaching, evidence would have to be gathered and analyzed in a systematic manner that S\* could cite as reasons in favor of her hypothesis. Moreover, according to *Trademark 2*, scientific knowledge is typically harder to acquire than ordinary knowledge. But pragmatic encroachment on scientific knowledge appears to be committed to the claim that S\* has acquired scientific knowledge on a basis that is insufficient for ordinary knowledge.

Consequently, ascribing scientific knowledge for one person and rejecting ordinary knowledge for another although they are in the same epistemic position is highly problematic. We may call this problem for the pragmatic encroacher ‘*the problem of demanding knowledge*.’The present version of the problem is particularly pressing for pragmatic encroachment about *scientific* knowledge because it arises from reflection about what is characteristic about scientific knowledge.

**5: Extending the Argument Argument.** As mentioned, pragmatic encroachment has seen its fair share of case-based and principled objections (Neta 2007; Blome-Tillmann 2009). Here I will consider an argument against pragmatic encroachment that I have given elsewhere (Gerken 2017) and argue that it extends to the case of pragmatic encroachment on scientific knowledge. The basic of the argument is that if practical factors even indirectly and partly determined the truth-values of knowledge ascriptions, it should be natural to appeal to them as reasons in *arguments* for and, more straightforwardly, against knowledge ascriptions. But this is far from natural. I call the argument the Argument Argument and here is an instance of it applied to scientific knowledge:

**The Argument Argument**

A1: The true theory of scientific knowledge or ‘scientific knowledge’ is a pragmatic encroachment theory only if practical factors may partly determine the truth-value of scientific knowledge ascriptions. [By PEAK]

A2: If practical factors may partly determine the truth-value of scientific knowledge ascriptions, then ((reasonably) believed) practical factors can be good partial epistemic reasons to ascribe/deny scientific knowledge.

A3: It is not part of our reason-giving practices to cite ((reasonably) believed) practical factors as partial epistemic reasons in arguments for ascribing/denying scientific knowledge.

A4: If it is not part of our reason-giving practices to cite ((reasonably) believed) practical factors as partial epistemic reasons in arguments for ascribing/denying scientific knowledge, then ((reasonably) believed) practical factors cannot be good partial epistemic reasons to ascribe/deny scientific knowledge.

A5: ((Reasonably) believed) practical factors cannot be good partial epistemic reasons to ascribe/deny scientific knowledge. [A3, A4, MP]

A6: Practical factors may not partly determine the truth-value of scientific knowledge ascriptions. [A2, A5, MT]

A7: The true theory of scientific knowledge or ‘scientific knowledge’ is not a pragmatic encroachment theory. [A1, A6, MT]

I have specified the original Argument Argument to concern scientific knowledge and ‘scientific knowledge.’ Thus, A1 is an instance the left-to-right direction PEAK sketched above. Likewise, the motivation for A2 is similar to the motivation that I have articulated in some detail elsewhere (Gerken 2017). The basic idea underlying A2 is that a factor that bears (even partly and indirectly) on some claim may be cited as a reason for and, more easily, against that claim in an explicit argument. Thus a scientist may naturally say:

(i): There could be water on Planet X. But we do not at present have any evidence for the hypothesis. Therefore, we do not know that there is water on Planet X.

Given a conversational setting where all other necessary conditions on scientific knowledge are presupposed to be met, a scientist may even say:

(ii): After years of investigation, we have now found a wide array of excellent evidence that there is ice on Mars. Therefore, we now know that there is ice on Mars.

In contrast, it is not part of scientists’ practice to cite practical factors in arguments concluding that some scientific hypothesis is known. To see this, consider, in contrast with (i) and (ii), the following:

(iii): Our lab will be defunded if it is false that rising ocean temperatures contribute to bleaching of coral reefs. Therefore, we do not know that rising ocean temperatures contribute to bleaching of coral reefs.

Likewise, a scientist with limited evidence that molecules X and Y bind will have a short career if she argues for this claim as follows:

(iv): It turns out that it does not matter to us or anyone else if molecules X and Y bind. Therefore, we know that molecules X and Y bind.

Given the infelicity of (iii) and (iv), A3 is plausible even though the unqualified ‘knowledge’ is replaced with ‘scientific knowledge.’ A4 is motivated by the assumption that ordinary and scientific reason-giving in overt arguments is at least *prima facie* evidence for what is and is not a good epistemic reason (see Gerken 2017, Ch. 4.3 for the full story). Indeed, to insist that scientists are misguided in not citing practical factors in arguments for or against scientific knowledge ascriptions would appear to amount to an error-theory of scientific practice.

Thus, the *Argument Argument* appears to generalize to compromise the idea of pragmatic encroachment on scientific knowledge. In fact, the argument might be even stronger with regard to scientific knowledge. After all, citing highly contingent practical factors as reasons in arguments for regarding some scientific hypothesis as scientific knowledge flies in the fact of the overarching scientific value of intersubjective objectivity.

Before moving on, it should be noted that the conclusion is entirely compatible with assuming that scientists may be influence by practical factors in choosing which theory to *accept* in the sense of adopting as a working hypothesis for practical purposes or further research (Douglas 2009; Brown 2013; Elliott and McKaughan 2014; Miller 2014). Likewise, the conclusion is compatible with the idea that practical factors bear on whether it is appropriate to provide scientific expert testimony concerning a scientific theory or hypothesis (Steele 2012. See also Author forthcoming b). The argument only concerns scientific knowledge and the sort of arguments scientists give for ascribing or denying it.

**6: Pragmatic encroachment and the scientific realism/anti-realism debate.** The arguments given so far may appear to presuppose a framework of scientific realism. After all, they appeal to the overarching ideal of objectivity and make realistically flavored claims about, for example, the nature of evidence and the aim of scientific theories. Moreover, Roush has suggested that realist theories cannot accommodate the idea that practical factors can bear on theory acceptance. Specifically, she suggests that the realist “can never get to the point where other reasons become legitimate positive reasons for acceptance. This is because if the realist ever got to the point where she had discharged her epistemic duty, there would be only one theory left to choose from.” (Roush 2007: 182). Consequently, it is important to consider whether the case against pragmatic encroachment is most plausibly embedded in a framework of scientific anti-realism.

The discussions surrounding scientific realism have many facets – the status of unobservables, laws of nature, scientific explanation, the aim of science etc. In consequence, the present discussion will have to be preliminary. This all the more so because the philosophy of science features substantive debates about how best to characterize scientific realism and scientific anti-realism. Consequently, I will consider a somewhat minimal textbook characterization of scientific realism (e.g., Bird 1998; Godfrey-Smith 2004; Chakravartty 2011). According to such a characterization of scientific realism, scientific theories and hypothesis are

SR 1: evaluable in terms of (approximate) truth of an objective reality.

SR 2: reasonably aiming at (approximate) truth of an objective reality.

This characterization does not require that scientific theories *be* (approximately) true. Rather, it says simply that they may be *assessed* in terms of truth of an objective reality and, hence, that there is such an objective reality. Standardly, the notion of objectivity is characterized in terms of mind-independence or theory-independence (e.g., Psillos 1999: xix).

Often further conditions are included in the characterization of scientific realism.[[9]](#footnote-9) Such further conditions may include the view that unobservable entities hypothesized by the scientific theories genuinely exist and that true theories explain observable phenomena (e.g., Bird 1998; Chakravartty 2011). But I will set aside discussions about unobservable entities and scientific explanation in order to focus on metaphysical scientific anti-realism which rejects SR 1 and pragmatic varieties of constructive empiricism which rejects SR 2.

**6.a. Metaphysical antirealism.** One radical kind of scientific anti-realism rejects SR 1 on metaphysical grounds by rejecting the idea that theories may truly represent an objective reality. Given that scientific theories, according to such an anti-realism, are not truth-evaluable SR 2 is rejected as a consequence. Likewise, further claims associated with scientific realism – such as the existence of unobservable entities – are rejected as a consequence of the rejection of SR 1. Thus, the characteristic feature of such a radical metaphysical anti-realism is the rejection of metaphysical commitment to the existence of an objective (mind or theory independent) reality. Given this stance, the rejection of the rest of the anti-realist commitments ensues.

Given that such a metaphysical anti-realism is hard to square with strict purism about scientific knowledge, one might think that it would be an apt ally for pragmatic encroachment theories about scientific knowledge. After all, if the arguments against pragmatic encroachment on scientific knowledge hinges on a realist assumption such as SR 1, rejecting that assumption would appear to amount to a defense of pragmatic encroachment on scientific knowledge.

However, the putative alliance between metaphysical anti-realism and pragmatic encroachment on scientific knowledge may be untenable for pragmatic encroachers. The reason why is that pragmatic encroachment on scientific knowledge is not clearly coherent with metaphysical anti-realism insofar as the relevant kind of knowledge is presumed to be factive. Given factivity of scientific knowledge, scientific theories and hypotheses are known only if they are true of their subject matter. But this appears to presuppose that the belief, theory or hypothesis can be evaluated with regard to truth of this subject matter. So, a pragmatic encroacher would at least have to commit to an anti-realist theory of truth. However, pragmatic encroachers do not typically seek to *replace* the traditional truth requirement on knowledge with practical factors or to revise it with an anti-realist account of truth. Rather, the view is typically the much more modest claim that the truth requirement must be supplemented with a pragmatic requirement. Roughly, that knowledge, and *a fortiori* scientific knowledge, requires that the epistemic strength of subject’s belief, theory or hypothesis must match a threshold determined in part by practical factors. So, an alliance between pragmatic encroachment theories on scientific knowledge and metaphysical anti-realism runs the risk of abandoning the explanandum of scientific knowledge in the process of defending the pragmatic encroachment theory of it. This may amount to relieving the headache by cutting off the head.

Of course, the matter is complex and I emphasize that I have not sought to argue that all species of pragmatic encroachment on scientific knowledge are incompatible with all species of metaphysical scientific anti-realism. However, an alliance between the two views will at least render pragmatic encroachment theories on scientific knowledge a rather radical view. In consequence, I will consider whether a more moderate scientific anti-realism might be more suitable.

**6.b. Constructive empiricism.** The key claims of constructive empiricist views are often regarded as more moderate than the ones that reject SR 1. A characteristic claim of constructivist empiricist brands of scientific anti-realism is the denial of SR 2 – the view that scientific theories and hypothesis should aim at truly representing an objective reality. Rather, the aim of scientific theories and hypothesis should aim at being empirically adequate – i.e., compatible with observable data (van Fraassen 1980. See also Monton 2007). Constructive empiricism is compatible with the idea that scientific theories and hypotheses – including those concerning or postulating unobservable entities – may be true and, it in this regard it is not in conflict with the idea that scientific knowledge entails truth. However, it is empirical adequacy rather than truth that is, according to constructive empiricism, the proper aim of scientific theories and hypotheses. Van Fraassen characterizes empirical adequacy as consistency with direct observation and this has led to an extensive discussion about the distinction between observation, detection and theorizing (Fodor 1984; Churchland 1985; Hacking 1985; Ladyman 2000; Dicken and Lipton 2006; Muller and van Fraassen 2008). While this cluster of issues raises challenges to constructive empiricism that anyone who accepts it must address, I will, for the purposes of focusing the present discussion, set aside these important debates and turn to the issue of theory choice. For it is here pragmatic considerations enter the constructive empiricist framework in a way that might intersect with pragmatic encroachment.

Often multiple empirically adequate theories are available and in consequence constructivist empiricists face the task of choosing between them. Such problems of empirical underdetermination and theory-choice are not unique to constructive empiricism. However, the problem of empirical underdetermination is particularly pressing for constructive empiricism since admissible data is restricted to *observable* data. Given this restriction, the range of empirically adequate theories widens. Roush, who pursues constructive empiricism as a framework that can accommodate social values in science, notes this asymmetry between scientific realism and constructive empiricism as follows: “For a given domain, there is only one true theory, whereas there are in general many empirically adequate ones” (Roush 2007: 167).

Van Fraassen addresses the problem of theory choice in two moves. The first move consists in introducing the idea of permissible *acceptance* of a scientific theory or hypothesis. Acceptance differs from belief that the theory is true insofar it only “…involves as belief only that it is empirically adequate” (can Fraassen 1980: 12).

The second move requires a little more discussion. It is a pragmatic move that consists in including pragmatic criteria for acceptance of scientific theories and hypotheses: “because the amount of belief involved in acceptance is typically less according to anti-realists, they will tend to make more of the pragmatic aspects” (van Fraassen 1980: 13). For example, van Fraassen takes it to be an advantage of a theory if it is “mathematically elegant, simple, of great scope, complete in certain respects: also of wonderful use in unifying our account of hitherto disparate phenomena, and most of all, explanatory.” (van Fraassen 1980: 87). Of course, scientific realists may argue that these properties of a theory are truth-relevant and, hence, epistemically beneficial. But van Fraassen argues to the contrary in several cases. For example, he insists that simplicity is not an indicator of truth (van Fraassen 1980: 90). More subtly, van Fraassen argues that explanation is context-dependent and that the contextual variance in what counts as a good explanation (van Fraassen 1977, 1980). In his own words, an explanation is “…evaluated vis-à-vis a question, which is a request for information… … what is requested differs from context to context (van Fraassen 1980: 156). Moreover, the context is partly determined by the *interests* of those seeking an explanation. So, in the case of scientific explanation, the interests of the scientific community partly determine whether an explanation is good (van Fraassen 1980).[[10]](#footnote-10) So, since the choice of theory or hypothesis depends on its explanatory qualities, such choices also depend on interests and similar practical factors relevant to the scientific community. In consequence, certain practical factors may “provide reasons to prefer the theory independently of questions of truth” (van

Fraassen 1980: 88).

One consequence, according to Roush, is that constructive empiricism is distinctively apt to accommodate social values: “For the constructive empiricist, social values can legitimately play a role in grounding choices among theories when these are choices among theories all of which are legitimately believed at a given time to be empirically adequate, because the choice of one among these theories is a pragmatic affair.” (Roush: 168). More generally, constructive empiricists may emphasize the usefulness of a theory – for example by its potential to make predictions about the area of reality that matters to the scientific community or, on some varieties of the view, the broader community that it serves. The key point, however, is that practical factors may serve as a “deadlock breaker” when scientists face a choice of accepting one among incompatible theories or hypotheses that are believed to be equally empirically adequate.

Such a pragmatic aspect of constructive empiricism appears to mark an important area of overlap with pragmatic encroachment theories of scientific knowledge. However, before exploring this potential alliance, one issue must be addressed. This is the issue as to whether the notion of acceptance may serve in an account of scientific knowledge as a scientific counterpart of belief in an account of non-scientific knowledge. Although this is a substantive issue, I will for the present purpose, assume that an accepted hypothesis may be scientifically known insofar as it is true and other conditions are met. Note that to say that acceptance may serve as a as a scientific counterpart of belief in an account of scientific knowledge is *not* to reject the distinction between belief and acceptance. Rather, what is granted is that another attitude than belief – namely, acceptance – may *replace* the belief-condition in an account of scientific knowledge. Thus, a scientist may be said to know a hypothesis that she does not believe. This assumption is not entirely unmotivated since there is a tradition in the philosophy of science of allowing collective acceptance to replace the relevant analog of belief in an account of scientific knowledge (see Cohen 1989; Wray 2001. See also de Ridder 2014). Yet, this assumption may in some ways be contrary to the spirit of constructive empiricism.[[11]](#footnote-11) But since pragmatic encroachers (of the metaphysical variety) are theorizing about knowledge and typically include a doxastic condition on it, the assumption that acceptance may do the job appears to be required.

Given this assumption, a *variety* of constructive empiricism may emerge as a potential ally for theories postulating pragmatic encroachment on scientific knowledge. This variety is one according to which practical factors partly determine whether scientists are permitted to accept a hypothesis and, consequently, whether the hypothesis may be (scientifically) known. Such a variety of constructive empiricism may appear to provide the right mix between consistency with the very idea of scientific knowledge and pragmatic features that aligns with pragmatic encroachment theories in a principled manner. Thus, it appears that there is an independently motivated framework in the philosophy of science which can naturally harbor pragmatic encroachment theories of scientific knowledge.

Moreover, this combination of views may have some force in responding to cases such as *PERSONAL STAKES VARIATION*. According to this view, neither Seana’s nor Sean’s personal stakes are determining factors. Rather, the relevant stakes are those which are relevant to the general scientific community and this aspect of the account provides some stabilization. Of course, this response is at odds with specifically *subject*-sensitive brands of pragmatic encroachment (Stanley 2005). However, the response is compatible with the right-hand-side of PEAK which does not specify what the relevant practical factors are and to whom they apply. In fact, pragmatic encroachers of the subject-sensitive variety may say that this is a difference between ordinary and scientific knowledge. Secondly, some pragmatic encroachers have independently sought to “stabilize” stakes variation by invoking community interests instead of individual ones (Grimm 2015; Hannon 2015). So, the combination of this variety of pragmatic encroachment theories of scientific knowledge and the outlined variety of constructive empiricism may form a broader framework that is capable of addressing some specific problems. Indeed, constructive empiricism has been seen as a background framework that best harbors the claim that the value-free ideal of science cannot be upheld. As mentioned, Roush suggests that constructive empiricism “may be the only way to grant a legitimate role to social values in theory choice” (Roush 2007: 166). Thus, it is worth considering whether an alliance between pragmatic encroachment and constructive empiricism may be formed.

**6.c: Challenges for the alliance between constructive empiricism and pragmatic encroachment.** In the previous section, I have done my best to align pragmatic encroachment theories on scientific knowledge with a variety of a broader and independently motivated (if controversial) framework within the philosophy of science. In this section, I will argue that there are significant costs to such an alliance. Furthermore, some of the fundamental problems for pragmatic encroachment theories of scientific knowledge persist despite it.

One concern is that the practical factors that constructive empiricists typically include in an account of theory *acceptance* are rather different from the sort of practical factors that pragmatic encroachers typically appeal to. The differences pertain both to the substance of the practical factors and the role they play. A substantive difference is that the practical factors involved in choice of acceptance of scientific theory or hypothesis are most naturally seen as pertaining to the *usefulness* of the theories or hypotheses under consideration. In contrast, pragmatic encroachers have often focused on the stakes associated with the complement clause of the knowledge ascription although stakes are often merely indicating actionability (Fantl and McGrath 2009; Gerken 2017, Ch. 12).

However, it is not clear how usefulness and stakes are supposed to be related. This is indicated by reflection on the distinct *roles* that practical factors play in a constructivist account of theory/hypothesis acceptance and in pragmatic encroachment theories of scientific knowledge, respectively. Indeed, these different roles of practical factors may give rise to a little dilemma. On the one hand, if a high-stakes hypothesis is assumed to be one that it is *not* pragmatically useful to accept, it is not clear that the practical factors concerning usefulness may play the role of “deadlock breaker” between incompatible but empirically adequate theories of hypotheses. On the other hand, if a high-stakes hypothesis is assumed to be one that it *is* pragmatically useful to accept, a considerable tension rears its head. For pragmatic encroachers typically have it that the higher the stakes pertaining to *p*, the harder it is to know that *p*. But this is contrary to the idea that the higher the stakes are, the easier it is to be rationally permitted to accept a hypothesis and, hence, easier for that hypothesis to be a candidate of scientific knowledge. Naturally, there is amble room for theoretical development here. So, I set forth the dilemma as a principled challenge that must be addressed to bring pragmatic encroachment theories in a mutually supporting alignment with constructive empiricism. In particular, the dilemma may indicate that the differences that pertain to acceptance may run so deep that it endangers any real alliance between pragmatic encroachment and constructive empiricism. So, let us revisit this issue.

Recall that to align pragmatic encroachment theories of scientific *knowledge* with constructive empiricism, we had to assume that acceptance of a hypothesis could meet the doxastic requirement on scientific knowledge. However, according to constructive empiricism, the practical factors only bear on the permissible acceptability of a theory. In contrast, pragmatic encroachment has a further commitment concerning the impact of practical factors. Indeed, pragmatic encroachers are careful to note that their theory does not merely postulate that practical factors may determine whether a subject is inclined to believe that *p*. Recall that this is reflected in PEAK’s right-hand-side according to which “…practical factors may partly determine the truth-value of ascriptions that S knows that *p* – *even though they do not partly determine S’s belief that p*” (added emphasis).

Indeed, a stock *objection* to pragmatic encroachment theories of knowledge is that practical factors – such as high stakes – may defeat knowledge by defeating belief but that knowledge is defeated *only* in this type of cases (Bach 2005; Weatherson 2005. But see also Ganson 2008 and Nagel 2010). In response, pragmatic encroachers argue that the theory involves the *further* claim that even when the relevant doxastic conditions is met, knowledge may be *epistemically* defeated by practical factors such as high stakes (for elaboration, see Gerken 2017, Ch. 3 and 12). Given this central aspect of pragmatic encroachment, however, the similarity between constructive empiricism and pragmatic encroachment appears to be a superficial one that covers over a deeper difference. For the practical factors are, according to constructivist empiricism bearing on the issue of acceptance whereas pragmatic encroachment is committed to the considerably stronger thesis that practical factors bears on the distinctively *epistemic* status that goes beyond the doxastic requirement on knowledge.

So, even if we have good pragmatic reasons for accepting (in van Fraassen’s sense) an empirically adequate theory, this is a far cry from the claim that these pragmatic reasons bear on whether we know the theory in question. In fact, van Fraassen himself appears to reject the latter claim: “pragmatic virtues do not give us any reason over and above the evidence of empirical data, for thinking that a theory is true (1980: 4). Indeed, he claims that pragmatic reasons for theory acceptance “cannot rationally guide our epistemic attitudes and decisions” (van Fraassen 1980: 87).

Roush is also clear that constructive empiricism only accommodates a limited role for practical factors: “the choice between two epistemically tied rivals that according to CE we legitimately make after the evidence is in is not a choice about which theory is closer to the truth, is more empirically adequate, or has more evidence in its favor. It is a choice about which theory serves better our practical goals (Roush 2007: 177). Thus, the impact of social values on science that Roush takes constructive empiricism to accommodate is far weaker than pragmatic encroachment on scientific knowledge. Indeed, Roush highlights that the brand of constructive empiricism that she is developing “… has the feature that we can acknowledge a legitimate role for social values in theory choice while not admitting that social preferences can be reasons to believe a theory true (or empirically adequate)” (Roush 2007: 180). Thus, both van Fraassen and Roush, who regard constructive empiricism who regard it providing room for social values, are clear that the brand of pragmatism involved in constructive empiricism falls short of what is required for pragmatic encroachment on scientific knowledge.

Once we recognize this point, it may also be recognized that an assumption that I made for the sake of argument is far from benign. This is the assumption that acceptance could serve as the doxastic condition of scientific knowledge. However, it is clear that theory acceptance may be *rationalized* by practical factors in a manner that is fundamentally different from belief that a theory is true (or empirically adequate). Consequently, it is very implausible that a merely accepted theory amount to scientific knowledge in cases of underdetermination of evidence. That is, if an empirically adequate theory A is accepted over an empirically adequate theory B on the basis of practical factors, then both realists and constructive empiricist should reject that theory A is known. After all, theory B is an undefeated defeater to theory A and the practical factors do nothing in defeating it.

Finally, it is important to note that the combination of pragmatic encroachment on scientific knowledge and constructive empiricism does not address all of the problems mounted against the former. For example, the instance of *The Argument Argument* that concerns scientific knowledge remains a challenge. However, there is a *prima facie* conflict between the idea of citing practical factors as reasons for ascriptions/denials of scientific knowledge and the scientific ideal of objectivity. So, responding to the *Argument Argument* is at least as urgent for proponents of pragmatic encroachment on scientific knowledge as it is for proponents of pragmatic encroachment on ordinary knowledge.

Furthermore, while the combination of pragmatic encroachment on scientific knowledge and constructive empiricism may have the resources to address some of the problematic cases, many other challenging cases remain. Consider, for example, the response that consists in changing the relevant stakes from the subject of the ascription of scientific knowledge to the broader scientific community (or the even broader community that it serves). Whereas this response may address cases such as *PERSONAL STAKES VARIATION*, it does not to address cases such as *GENERAL STAKES VARIATION*. Thus, the core of the case-based arguments against pragmatic encroachment on scientific knowledge persists. Of course, this is not to say that such arguments are conclusive. But it does indicate that they may not be evaded simply by embedding pragmatic encroachment theories in a constructive empiricist framework. Rather, a principled response – or some bullet biting – is required.

**6.d: Concluding remarks on anti-realism as a framework for pragmatic encroachment.** In considering whether pragmatic encroachment on scientific knowledge may align with anti-realism, we have identified a number of challenges for such a combination of views. One challenge is that by aligning pragmatic encroachment with metaphysical anti-realist positions according to which scientific theories and hypothesis are not true, the pragmatic encroacher runs the risk of losing the baby of scientific knowledge with the bathwater of epistemic purism. For such anti-realisms appear to be incompatible with the kind of theory of knowledge that pragmatic encroachers typically pursue.

Initially, an alliance between pragmatic encroachment and constructive empiricism seemed far more promising. But on closer examination, there are considerable cracks in such an alliance and some of the most severe challenges for pragmatic encroachment theories persist. So, in conclusion, embracing some form of anti-realism is unlikely to provide a quick response to the challenges for pragmatic encroachment theories of scientific knowledge.

**7: Concluding remarks.** The aspects of pragmatic encroachment on scientific knowledge considered here suggest that the view faces serious challenges. First of all, the challenges that beset pragmatic encroachment on ordinary knowledge also compromise pragmatic encroachment on scientific knowledge. But, moreover, they appear to be particularly troublesome in the case of scientific knowledge. The noted trademarksof scientific knowledge help explain this. Recall that, according to *Trademark 1* and *2*, scientific knowledge tends to be harder to acquire than ordinary knowledge in part because it must typically be acquired in a systematic manner and backed by a demanding internalist species of warrant – discursive justification. Relatedly, *Trademark 3* has it that scientific knowledge is, as opposed to ordinary knowledge, typically intersubjectively replicable. So, given these trademarksof scientific knowledge, it is a *less* likely candidate for pragmatic encroachment than ordinary knowledge. The trademarks reflect the less individualistic and more objective character of scientific knowledge whereas the cases for pragmatic encroachers appeal to involve variations in subjective stakes (Stanley 2005; Fantl and McGrath 2009). The same is true of the experimental findings that are cited in support of pragmatic encroachment (Sripada and Stanley 2011; Pinillos 2012).

I considered whether pragmatic encroachment about scientific knowledge might be embedded in an anti-realistic framework. But this too proved to be a challenge. Metaphysically anti-realist frameworks appear to be incompatible with the sort of theories of knowledge that pragmatic encroachers are committed to. Constructive empiricist frameworks appeared to be more promising at first glance. But a closer examination revealed both significant conflicts and substantive problems.

While I have considered the realist/anti-realist debate, it remains to be investigated how other frameworks and discussions in the philosophy of science bear on pragmatic encroachment (see, e.g., Miller 2014). However, the present exploration provides some reasons to assume that there are plenty of challenges ahead for pragmatic encroachment theories about scientific knowledge.[[12]](#footnote-12)

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1. A notable exception is (Miller 2014) who appeals to considerations about the *inductive risk* (cf. Douglas 2009) in an argument for pragmatic encroachment. Since the issue is complex, the argument is best addressed separately. [↑](#footnote-ref-1)
2. For the distinction between metaphysical and semantic purism (Stanley 2005; Fantl and McGrath 2009; Buckwalter and Schaffer 2015). Metaphysical impurists include Hawthorne 2004; Stanley 2005; Fantl and McGrath 2009. Strict purist invariantists include Bach 2005; Brown 2008; Rysiew 2007; Williamson 2005; Nagel 2008; Gerken 2011, 2017). It can be a hard exegetical question whether contextualists such as DeRose 2009 and Lewis 1996 exemplify semantic impurism. Clearer cases are Greco 2012; Hannon 2013; Henderson 2009, 2011. Semantic impurists most commonly articulate their view in terms of shifting truth-conditions. However, some semantic impurists articulate it in terms of stable truth-conditions but shifting truth-values (Brogaard 2008; MacFarlane 2005). [↑](#footnote-ref-2)
3. In Gerken 2017 Chapter 4.3.c I give some reasons to suspect that the arguments extend to semantic impurism. [↑](#footnote-ref-3)
4. The terminology is from Burge 2003. I will rely on previous work in which I argue that both justification and entitlement may fulfill the warrant requirement on knowledge (Gerken 2013, 2015, forthcoming a). [↑](#footnote-ref-4)
5. Note that Hoyningen-Huene uses ‘scientific knowledge’ in a non-factive manner (Hoyningen-Huene 2016: 21). It should moreover be noted that the present rationale for *Trademark 1* does not require commitment to the more controversial aspects of Hoyningen-Huene account. The required assumption is merely that scientific knowledge is characteristically based on highly systematic investigation. [↑](#footnote-ref-5)
6. A referee correctly notes scientists characteristically adopt a fallibilist attitude and that prominent arguments for pragmatic encroachment proceed from fallibilism and knowledge-action principles (e.g., Fantl and McGrath 2009). I will not address such arguments on this occasion but I do by arguing against knowledge-action principles in (Gerken 2017). [↑](#footnote-ref-6)
7. Thanks to Kareem Khalifa on this point. [↑](#footnote-ref-7)
8. Coral bleaching is the phenomenon that corals turn white because they expel the symbiotic algae that live in their tissues due to stress of various forms (including, but not restricted, to rising temperature). [↑](#footnote-ref-8)
9. Some theorists take further conditions to be required because casting the issue in terms of the mere aims of science is taken as too weak insofar as it is consistent with science never achieving these aims (see e.g., Kitcher 1993: 150. This leads to a discussion about whether and that what extend science tracks truth, Kukla 1998; Psillos 1999). [↑](#footnote-ref-9)
10. One prominent criticism, due to Kitcher and Salmon, is that even if there are contextual constraints on explanation, non-contextual objective factors remain important (Kitcher and Salmon 1987. See also Salmon 1989 for more general criticism of pragmatic theories of explanation). In the present context, however, it is worth noting that pragmatic encroachers on knowledge also admit of objective factors. So, all that is required is that objective (truth-related) factors do not exhaust the determiners of a good explanation but that practical factors are *part* of the story. [↑](#footnote-ref-10)
11. van Fraassen often prefers to talk about the permissability of committing to a theory. [↑](#footnote-ref-11)
12. The chapter was presented at a workshop at the University of Southern Denmark in March 2017 and I thank the participants for helpful comments. I’m especially grateful to Kareem Khalifa, Brian Kim and an anonymous referee for Routledge who all provided me with incisive written comments that led to many substantive and presentational changes. [↑](#footnote-ref-12)