

ON THE CONTENT AND CHARACTER OF PAIN EXPERIENCE

(Final Version published in *Pacific Philosophical Quarterly*, (2019), 100 (1), pp.47-68.

BY

RICHARD GRAY

Abstract: Tracking representationalism explains the negative affective character of pain, and its capacity to motivate action, by reference to the representation of the badness for us of bodily damage. I argue that there is a more fitting instantiation of the tracking relation – the badness for us of extremely intense stimuli – and use this to motivate a non-reductive approach to the negative affective character of pain. The view of pain proposed here is supported by consideration of three related topics: the pain caused when the body is damaged, reparative pain, and the messenger-shooting objection to tracking representationalism.

1. Introduction

Pain experiences differ from paradigmatic perceptual experiences in two main ways, or so it is generally held: pain experiences have a distinctive negative affective character that is lacking in paradigmatic perceptual experiences and pain experiences motivate our actions directly in a way

that paradigmatic perceptual experiences do not. Advocates of *representationalism* have recently sought to address both features of pain experience at a single stroke by supplementing the contents that are represented by pain experience.¹ As Cutter & Tye put it: ‘our pain experiences do not just represent the presence of tissue damage, but also (roughly) represent our tissue damage as bad for us to some degree’.² The idea is that the representation of *valuational* properties explains both the negative affective character of pain and the motivation we have for responding to pain.³

Here I endorse a representationalist approach to pain experience, but with two significant modifications to the version advocated by Cutter & Tye, and others. First, I raise doubts about bodily damage, or any other property of the body, being the appropriate non-valuational content of pain experience, at least for a substantial proportion of pain experiences. Second, I argue that the explanation of the abovementioned features of pain requires a non-reductive approach to pain. The first point of disagreement paves the way for the second point of disagreement, and the motivation for the former lies in a key feature of Cutter & Tye’s own account: their theory of content determination.⁴

Tracking representationalism combines a thesis about the character of experience – that it supervenes on the content of experience – with a thesis about the content of experience – that it is determined by a tracking relation. Token experiences, according to Cutter & Tye, are token neural states. They are tokens of a type of experience in virtue of instantiating the following tracking theory of intentionality:

Tracking Theory of Intentionality (TTI): Tokens of a state *S* in an individual *x* represent that *p* in virtue of the fact that: under optimal conditions, *x* tokens *S* iff *p*, and because *p*.⁵

In the case of a paradigmatic perceptual experience, such as a visual experience, optimal conditions are those that ‘the visual system was designed to operate in by natural selection or by some analogous process in the course of ontogenic development’. They maintain that the same applies to other modes of perception, and also to pain experience.

They ask their readers to consider a pain in the forearm. They state that ‘[u]nder normal conditions, experiences of this type are caused by the presence of damage or disturbance of tissue in a forearm’.⁶ They reason that ‘tissue damage or disturbance is what pain experiences track, so it follows from TTI that this is what pain experiences represent’.⁷ The main problem for their account, as they see it, is that it may seem unable to explain the negative affective character of pain. For the representational content seems to be exhausted by ‘the location and physiological properties of some tissue damage or disturbance’, given that it is only these properties that seem to be causally relevant to the instantiation of tokens of state *S* in an individual. Their response is to supplement the contents of pain experience with valuational properties: pain experiences do not just represent the location and physiological properties of tissue damage or disturbance but also the tissue damage or disturbance as bad for us to some degree. Valuational properties can be and are represented by pain experience, in their view, in so far as brain states are causally sensitive to them. Valuational properties are

properties to which we are causally sensitive because it is plausible to think that, necessarily, some property is bad for us if and only if it is apt to harm us, and the property of being apt to harm us is something to which we can be causally sensitive.⁸ It is the representation of bodily damage or disturbance as bad for us that is claimed to explain the motivational capacity of pain.

In the following I contest Cutter & Tye's application of TTI. I focus on two respects in which its application challenges their own view of the non-valuational content of pain experience. This provides reason to re-assess the explanation given of the negative affective character of pain in terms of the valuational content of pain experience, and, therefore, of the related representationalist explanation of the motivational capacity of pain.

In §2, I argue that for a significant class of pain experiences, TTI is instantiated not by bodily damage, nor by any other property of the body, but by the extreme intensity of stimuli impinging on the body. In these cases, pain experience has an exteroceptive role: to determine the extreme intensity of stimuli impinging on the body. Given that pains are standardly taken to be located in the body, and thus interoceptive, the exteroceptive role of pain may be counter-intuitive and of note in itself. But it is not so much this that is an issue for a representationalist approach. Indeed, if it is right that the best way in which to explain pain experiences, at least in many cases, is by distinguishing between exteroceptive and interoceptive experiences, this would provide further reason to endorse a representationalist approach. Rather, the exteroceptive role of pain raises the question, in a particularly vivid way,

of how the additional representation of valuational properties can explain the negative affective character of pain. A reductive explanation of the negative affective character would account for it fully by reference to the badness for us of the extreme intensity of stimuli impinging on the body, which would, in turn, be explained by natural properties of the extremely intense stimuli, such as their aptness to harm us. But, as §3 argues, such properties are implausible candidates for adequately explaining the qualitative properties of pain experiences. Hence there is reason to endorse a contrary position: the irreducibility of the negative affective character of pain experience to the content represented by the experience. According to this position, the negative affective character of pain experience constitutes a phenomenal mode of presentation of the valuational content. The question remains of why the badness for us of the extreme intensity of stimuli should be presented in this way: why should the representation of the badness for us of the extreme intensity of noxious stimuli feel bad? The answer proposed here is likewise non-reductive. Pain feels bad because it realizes twin functions: it represents the badness for us of the extreme intensity of stimuli and it motivates a response to it.

The second issue that the application of TTI raises concerns the optimal conditions condition. It is uncontroversial that pain experience is also related to bodily damage. After all, bodily damage typically causes pain. So the question arises of how the pain experience that follows bodily damage is related to the pain experience that determines the presence of noxious stimuli. Given that, typically, bodily damage is at odds with the presence of optimal conditions for bodily function, there is

a tension between the representation of bodily damage and misrepresentation caused by bodily damage. The tension has been overlooked in the recent literature and is addressed in §4. Even if some of the pain following bodily damage can be regarded as misrepresentational, it is implausible that all of it can be so regarded. Reparative pain plays a vital role in recovery from injury. §5 shows how much of the reparative pain associated with bodily damage can also best be understood as the representation of the badness for us of the extreme intensity of stimuli impinging on the body. §6 concludes by bringing together the results of preceding sections to provide a novel response to a problem that has already received a good deal of coverage in the recent literature: the *messenger-shooting objection* to representationalism.

2. The Exteroceptive Role of Pain

When Cutter & Tye write that the content of pain experience is ‘damage or disturbance’, and thus the object of a form of interoception, they are not endorsing the claim that pain experience represents a disjunction of contents. Rather they are tacitly acknowledging that they are not quite sure about the exact property of the body that is represented by pain experience.⁹ For TTI to provide the content of an experience, there must be one and only one property that causally co-varies with a type of experiential state under optimal conditions. Tye is explicit about the restriction on content in earlier work: although *S* may be tokened if and only if either of two properties is tokened, *S* can only be tokened either

because one disjunct is tokened or because the other disjunct is tokened; it cannot be tokened because the disjunction is tokened, since it is the distinct properties that are causally efficacious not their disjunction.¹⁰ There is a further reason why a disjunction of contents has to be rejected by Tye. As he is also committed to the claim that the character of an experience can be *reductively* explained by the content represented by an experience, two different and equally deserving candidate properties for the representational content of one type of experience would challenge that claim. The restriction on content is significant in the present context because there is another candidate for the content of pain experience that instantiates TTI.

Consider again their example of the pain in a forearm. What they do not mention, and they are far from alone in this, is the way in which pain, such as a pain in the forearm, is caused before the body is damaged. Consider a case in which a candle is held up to your forearm. After a while it will cause a pain in your forearm. But exactly what does the pain experience represent? Tye & Cutter, and many others, will presumably say that it represents disturbance (or damage) in the forearm. Perhaps that is how the pain experience seems to most people. Perhaps that is because most people think of the pain that is caused by damage to the body when they first think of pain. But there is another cause. Furthermore, it is a less problematic instantiation of TTI than damage or disturbance.

Pain experience is typically caused when nociceptors are activated. Nociceptors are sensory receptors that are responsive to stimuli of a greater energy than that to which the sensory receptors of

the paradigmatic perceptual modalities are sensitive.¹¹ The activation of nociceptors by such stimuli enables the extraction of information from the stimuli by transduction. In the case of the present example, transduction comes about when thermal stimuli of greater intensity than those which are detected by thermal perception impinge on the body and activate the nociceptors in the forearm causing the transmission of electrical signals. There is no reason to think that optimal conditions are not met. Given that, under optimal conditions, an individual tokens pain experiences of such a type if and only if extremely intense (thermal) stimuli impinge on the body and because they impinge on the body, according to TTI, a pain experience like the present example represents that there is something extremely intense impinging on the forearm.¹²

That pain is, at least in some cases, an exteroceptive experience of the extreme intensity of noxious stimuli impinging on the body might seem counterintuitive given that pains are usually taken to be located inside the body. Indeed, Grice rejects the possibility that pain experience is akin to the experiences of the paradigmatic exteroceptive senses; he points out that pains are not greatly and many types of object can inflict pain in a variety of ways.¹³ Hence the standard perceptualist view is that pain is interoceptive. Let me emphasize that I am not challenging Grice's rejection of that exteroceptive view here. I claim that pain experiences, at least in many cases, determine the extreme intensity of noxious stimuli that impinge on the body from outside it.¹⁴

An exteroceptive experience of this sort is not inconsistent with the phenomenology of pain. Pain experience of the kind exemplified here is related to tactile and thermal experiences, which, it is plausible to

think, are exteroceptive experiences of properties of stimuli impinging on the body. When one first feels the thermal stimuli emitted by the candle impinging on the body one experiences a sensation of heat. Exactly what one experiences is a tricky issue. But it is plausible to think that it is something outside the body impinging on the body.¹⁵ The phenomenal character of the experience is consistent with this. When the thermal stimuli get more intense another type of experience individuated by its distinctive negative affective character will occur. It may not be clear whether the heat sensation is supplemented by a pain experience or whether the heat sensation is replaced by a pain experience. If the latter, it may be vague where the boundary between an intense heat sensation and a pain sensation lies.¹⁶ Still, it would be hard to deny that when the stimuli are sufficiently intense a pain experience will be present that has a determinate negative affective character. And the pain experience will disappear when the stimuli are no longer present. There is nothing in the phenomenal character of the pain experience itself to suggest that one's experience changes from being of something outside the body's boundaries impinging on the body to something inside the body's boundaries. The quality of the experience is different from the earlier heat sensation, but there has been no apparent change in the location of what is experienced. Something similar applies in the case of pressure experience. When someone squeezes your forearm you at first feel the pressure on your forearm. It is plausible to think that what you experience is as of something outside the body impinging on the body. When the pressure gets more intense, there is nothing in the phenomenal character of the subsequent pain experience

to suggest that your pain experience is then as of something inside the body's boundaries.

Could it be that the pain experience represents tissue disturbance because the nociceptors respond to a change generated in the body's tissue by the stimuli? One might assume so. However, given that there is an appropriate distal cause, it is not clear that this would show that it is not the extreme intensity of the stimuli impinging on the body that is detected. Anyway, and more importantly, empirical evidence indicates that nociceptors respond *directly* to the noxious stimuli.¹⁷

Could it be that pain experience represents the activation of the nociceptors? That also causally covaries with pain experience. Again, a reason would have to be given for why it should be the proximal cause of pain experiences that is represented when there are appropriate distal causes. But there is a more significant reason for a representationalist to reject such a candidate for content in the present context. Even if pain experience represented some state of the body, even some disturbance of the body, by representing the activation of nociceptors, it is hard to see what negative valuational property would be represented. After all, it is the activation of nociceptors that protects us from the noxious stimuli caused by things such as candles.

Tracking representationalists should accept the upshot of the application of TTI that some pain is exteroceptive. It is not only consistent with their general approach to pain experience but a more accurate realization of it. An instantiation is provided for the non-valuational content of pain: the extreme intensity of noxious stimuli. It is plausible to think that such a property of stimuli can cause the brain

to token a state, *S*. And it also allows for a valuational property: the badness of the extreme intensity of such stimuli for one. Indeed, here it is a straightforward matter to identify the valuational property: the extreme intensity of stimuli is, additionally, bad for one to a certain degree because, if one does not remove the stimuli, they are apt to damage one's body to a certain degree. And it is plausible to think that we are causally sensitive to the badness of such stimuli because noxious stimuli cause us to respond to them in a way that we do not respond to stimuli that are not bad for us.

Moreover, there are *a priori* reasons to prefer such a view. Pain experience would be of more benefit were it an experience of the extreme intensity of noxious stimuli when effective pre-emptive action can be taken, than if it were an experience of a part of the body that is already in a bad state when only limited remedial action is possible. And it would be to our advantage were nociceptors sufficiently sensitive to noxious stimuli impinging on the body that they enable a direct response to their presence.¹⁸

Objections might still be raised. It might be argued that a reflex better explains this kind of example. And it might be argued that as far as protection from noxious stimuli is concerned pain experience is not a very efficient mechanism.¹⁹ No doubt both objections carry some weight. There is a quick neural pathway, which enables the prevention of damage, that does not involve the presence of pain experiences when stimuli are sufficiently intense. And no such pain experience will prevent some kinds of bodily damage. Nevertheless, there are all manner of stimuli that are bad for us that are not like these.²⁰ They occur at the

limits of sensitivity of our paradigmatic sensory systems. Given that our sensory systems have evolved to detect variations in the intensity of stimuli, it should not be a puzzle as to how and why we should be sensitive to the intensity of stimuli that can be sufficiently intense as to be bad for us.

None of the above is supposed to suggest that the exteroceptive role of pain is the only role of pain. Not all pain is exogenous (caused from outside the body); some pain is endogenous (caused from inside the body). But now the exteroceptive role of pain points to a rather different interpretation of the interoceptive role for pain than the usual one of representing a part of the body that is in a damaged or disturbed state. When pain is interoceptive, at least in many cases, it is plausible to think that it is also an experience of the extreme intensity of noxious stimuli. Imagine a time when you were sitting in an awkward posture. Just as we are aware of the position of parts of the body by detecting muscle, tendon and joint movement through proprioception, so we are aware of when one part of the body exerts too much pressure on another part of the body through nociception. But we should not think of this as an interoceptive experience of a part of the body that is in a bad state. That is because pain is not caused by a part of the body that is in a bad state. When one part of the body places extreme pressure on another part of the body, pain is caused by the extremely intense pressure of the impinging part of the body. The disturbed part of the body may cause pain but not because it is a disturbed part of the body; rather it brings about extremely intense pressure that comes to bear on the impinging part of the body. Given that, under optimal conditions, individuals token

such pain experiences if and only if extremely intense (pressure) stimuli impinge on a part of the body and because they impinge on a part of the body, according to TTI, such pain experiences represent that there is something extremely intense impinging on a part of the body from within the body.²¹

The distinction between exogenous and endogenous pain should not be controversial. What may be controversial is the claim that the distinction is relevant for a theory of pain. But there is a reason to think it is relevant. Protection of the body, to which few would dispute that pain experience contributes, requires protection *from* something. By distinguishing between exteroceptive and interoceptive pain experiences, a straightforward explanation can be given for why we respond to noxious stimuli impinging on the body from outside it in a way that is different from the way we respond to noxious stimuli impinging on the body from inside it: the respective experiences represent the different origins of their causes. The distinction is significant in the present context because it provides further support for a representationalist approach to pain experience.

There is another reason why the content just motivated is significant for the representationalist case. It has been claimed that the apparent heterogeneity of pain's causes is hard to square with the commonality of pain experiences. For instance, Klein supports his view that pain experience is solely constituted by imperative content (commands to protect the body by acting in a certain way) by reference to the commonality of pain experiences, which, so he claims, cannot be explained by a representationalist approach due to the diversity of pain's

causes.²² The challenge warrants a response. On the present approach, representational content is not as diverse as it might appear: pain experiences tend to be caused by the extreme intensity of noxious stimuli.

In sum, it is the extreme intensity of noxious stimuli that is, in normal circumstances, the necessary and sufficient cause of pain experiences.²³ As will be discussed further in §§4-5 respectively, bodily damage is neither necessary nor sufficient for pain experience. However, sense can also be made of those pain experiences that follow bodily damage by reference to the pain caused by noxious stimuli. Nevertheless, one respect in which the exteroceptive role of pain raises a question to the representationalist approach needs to be considered first.

3. Content, Character and Motivation

The previous section argued for a reassessment of the non-valuational content of pain experience, or at least of a large class of pain experiences. Representationalists are attentive to the content of experience for what it can tell us about the character of experience, which, it is minimally claimed, supervenes on the content of experience. So, the question arises: if pain experience represents the badness for us of extremely intense stimuli, what implications does this have for the account one gives of the character of pain experience?

Given the non-standard nature of the present account, it would seem that the non-valuational content identified here is not evident in the phenomenal character of pain experience. One explanation for this may be that, in normal circumstances, as soon as stimuli of a sufficiently great intensity impinge on the body, one experiences the negative affective character of pain. That is to say, as soon as the extreme intensity of stimuli impinging on the body is detected, it is represented as bad for us. This suggests two possibilities regarding the way in which the representation of the extreme intensity of stimuli is manifested in the character of experience: (1) the extreme intensity of stimuli is represented in pain experience but obscured by the representation of its badness for us, or (2) the extreme intensity of stimuli is not in itself represented in experience but is represented in virtue of the representation of the badness for us of the extreme intensity of stimuli.

There is some support for the view that both components of content constitute pain experience. It is held by representationalists, and others, that morphine cases and asymbolia are best explained by the dissociation of two components of pain experience: a proprietary sensory component and an affective component.²⁴ On the approach proposed here, the proprietary sensory component would not be what it is usually thought to be; it would not be of bodily damage or disturbance but of the extreme intensity of stimuli. Nevertheless, the sensory and affective components of pain experience could dissociate if the extreme intensity of noxious stimuli could be represented without the representation of its badness for one. Such experiences would plausibly be characterized by their greater intensity than that of normal

perceptual experiences of the intensity of stimuli. However, the present account would not be undermined if the sensory and affective elements do not, or could not, dissociate, or, as some accounts have held, there is no proprietary sensory component to pain experience.²⁵ In that case, the negative affective character of pain would represent the extreme intensity of stimuli in virtue of representing the badness for one of the extreme intensity of noxious stimuli.²⁶

In neither case would it be the representation of the extreme intensity of stimuli impinging on the body that explains the negative affective character of pain on the present account. This, in common with other representationalist accounts, is explained by the representation of the badness for one of the non-valuational content. Nevertheless, the reassessment of the non-valuational content gives rise to some consequences for how one explains the negative affective character of pain. It raises the question, in a particularly vivid way, of how the additional representation of valuational properties can explain the negative affective character of pain.

Cutter & Tye spend some time defending the claim that a valuational property can be represented against objections that it cannot instantiate the relevant causal relation with a specific type of state, *S*. The modification of the non-valuational content advocated here supports them. The badness for one of the extreme intensity of stimuli impinging on a part of the body has the relevant causal relation with a specific type of state, *S*, because brain states that respond to the extreme intensity of stimuli, do so not just because of the intensity of stimuli but because their intensity is bad for us.²⁷ However, there is a more serious

challenge that they do not address: how the badness for us of the extreme intensity of stimuli can have the requisite nature to constitute the character of an experience of it.

The existing exemplars for how to think of the constitution of the character of experience by the content of experience are to be found in paradigmatic perceptual experiences where content is a categorical physical property of things. Tye is well known for advocating a reductive explanation of phenomenal character. And it is such an explanation that seems to be assumed by Cutter & Tye in their account of the negative affective character of pain. But, in the case of pain experience, although its content – the aptness to harm of extremely intense stimuli – is, arguably, a natural property of things, it is hard to see how a dispositional property is the right kind of property to constitute the character of experience of it. After all, how can a mere disposition to have a certain effect have the appropriate qualitative nature to explain the character of experience? To compound matters, the dispositional property is also relational: the extreme intensity of stimuli has an aptness to harm because of the physical nature of our bodies. It is even harder to see how a dispositional property that is relational could be the right kind of property to constitute the character of experience of pain.

The difficulty does not arise for a contrary non-reductive representationalist explanation of phenomenal character, according to which phenomenal character is not explained by a property represented by experience but by a property of experience. Indeed, it is quite natural. The property of experience that constitutes the character of pain experience enables pain to pick out the property that causes it when TTI

is instantiated. That is to say, it constitutes the phenomenal mode of presentation of the badness of the extreme intensity of stimuli impinging on the body. Non-reductive representationalism is a form of representationalism because it accepts that pain experience has correctness conditions.²⁸ Pain experience is veridical, under normal circumstances, iff there is something extremely intense impinging on the body.

A non-reductive approach is also able to address a further issue. The preceding explanation of the character of pain experience does not explain why pain has its distinctive negative affective character, rather than some other character. It does not explain why the representation of the badness of something for us should feel bad to us. But only a minor modification to the proposal is required to address the issue. Pain experience has multiple functions: pain not only has the function of representing the badness for us of extremely intense stimuli; it also has the function of providing the motivation for a response to the stimuli that are bad for us.

Representationalists claim that pain experiences are motivational in virtue of the content that is represented by pain experience. For Bain, the claim seems ‘utterly natural: when the badness for you of a state of the body is impressed on you, this – independently of further desires – defeasibly motivates you to do something about that bodily state’.²⁹ The onus, he claims, is on those who deny this by maintaining ‘broad inertness’ to make the case for it. No doubt there is something plausible about the motivational power of a belief that one’s body is in a certain state when it is impressed on us independently of further desires. But

that is because it is the content of the belief that provides the motivation. And such contents are, plausibly, transparent to us when we have such beliefs.³⁰ But it is far from clear that we are aware of such contents as the contents they are when we have a pain experience. Indeed, the fact that a case can be made for a different content of pain experience suggests that such content is not impressed on us as the content that it is.³¹

The conclusion should not be drawn that pain experience does not have the content proposed here. After all, TTI gives us reason to think that it does. The conclusion should rather be drawn that the content of pain does not strike us as the content that it is: the badness for us of extremely intense stimuli. Therefore, it is not our grasp of the representational content that motivates a response to pain. A different explanation is, nevertheless, available.

Reductive representationalists seek to explain fully the negative affective character of pain and the motivational capacity of pain by reference to non-phenomenal features.³² The present approach eschews this with respect to the explanatory relationship between character and content. The difficulties with explaining the motivational capacity of pain experience by reference to representational content suggests that a non-reductive approach should also be considered with respect to the explanatory relationship between character, content and motivation. In order to explain the motivational capacity of pain we should not expect a full explanation by reference to natural features underlying pain experience; we should seek an explanation for the motivational capacity of pain, and thereby of the negative affective character of pain, by

reference to how the negative affective character of pain itself motivates our action.

The reassessment of the content of pain experience makes available a straightforward explanation of its character in this way: pain has its distinctive negative affective character in order to motivate the effects that it enables towards such content. The negative affective character of pain, under optimal conditions, constitutes not only the mode of presentation of the extreme intensity of noxious stimuli, it also provides the motivation for their removal by providing the motivation for its own elimination, which is, under normal circumstances, best achieved by the removal of the stimuli that cause it. On this approach, contrary to popular philosophical opinion, the negative affective character of pain experience can be explained by reference to its function.³³

Consider the pain experience that is, under optimal conditions, caused if and only if there is heat of an extreme intensity impinging on the forearm. In having its negative affective character, the pain experience represents the badness of the extremely intense thermal stimuli. But the negative affective character of pain is also irreducibly and non-instrumentally bad for one in so far as it feels bad for one. The negative affective character of the pain is thus such that, under normal circumstances, its elimination is an end that is sought in itself. Under normal circumstances, pain experiences of this type are most effectively eliminated by removing the noxious stimuli that cause them. In this way nature has found a means by which we can respond to noxious stimuli impinging on the body. The negative affective character of pain is

essential to the protective role of pain: it is because pain feels bad that it is instrumentally good. But, as will become clear, this is only so because optimal conditions pertain.

4. Nociception and Bodily Damage

If the candle is left under the forearm too long, its heat will damage the forearm. Pain is also caused by tissue damage. It is for this reason that nociception is often taken to be the sensory system that determines the presence of damage to the body. And it is for this reason that bodily damage is standardly cited as one of the main candidates for the content of pain experience. However, contrary to what Cutter & Tye claim, it is not the case that the pain experience caused when the body has been damaged instantiates TTI. Pain experience is present after the candle has been removed *because* the forearm has been damaged. And damage to a part of the body is often sufficient for a pain experience to occur. But damage to the body is not necessary for pain experience. As just explained, pain experience typically occurs when noxious stimuli impinge on the body without damaging the body.

In order to maintain their view that pain experiences represent the presence of tissue damage, Cutter & Tye would have to show that bodily damage is necessary for pain experience. Perhaps a clue is to be found in the need, already remarked on, to reject a disjunction of properties as the representational content of pain experience. The response sometimes canvassed when the problem of multiple contents

for pain is raised, which would also address the apparent non-necessity of bodily damage for pain experience, is to posit a more general cause of pain that includes its various causes. No such content has been met with general approval. And the task of finding an appropriate general content is now made all the more difficult by the presence of two such different causes of pain: noxious stimuli and bodily damage.

But, even if a response along the above lines was tenable, there is a further problem. In order for TTI to be instantiated, optimal conditions must obtain. And there are reasons to doubt that optimal conditions obtain in the case of the pain experience that is caused by bodily damage.

Roughly speaking, optimal conditions obtain in the case of perceptual experiences of the paradigmatic perceptual modalities when receptors dedicated to the detection of stimuli that mediate the perception of specific kinds of object are stimulated by those stimuli when they are caused by the appropriate objects. Optimal conditions are likewise in place in the case of nociception when nociceptors are stimulated by the extreme intensity of stimuli that are bad for us. However, matters are rather more complex in the case of the pain experience that arises when the body has been damaged. Indeed, there is a different way in which nociceptors are activated when the body is damaged that is not only at odds with the mechanisms of paradigmatic perceptual processes but that also normally undermines the success of such perceptual processes.

When the body is damaged, nociceptors also tend to be damaged. Pain experience is not only caused by the stimulation of nociceptors, it is

also caused by damage to the nociceptors. When the body *is being damaged*, as by the heat of the candle, the pain experience that results from damage to nociceptors continues to instantiate TTI; its presence continues to causally covary with the presence of stimuli that are bad for us. Indeed, pain still fulfils a purpose even though it is caused by the damage done to the nociceptors: it can prevent more damage being caused by the noxious stimuli impinging on the body. However, pain experience caused by damage to the nociceptors continues after the body *has been damaged*, when the candle has been removed. As just noted, the pain caused by such bodily damage does not instantiate TTI. Furthermore, in paradigmatic forms of perception, when damage to receptors gives rise to experiences, we do not think of those experiences as perceptual experiences. We do not think of ‘seeing stars’ or ‘hearing a ringing in the ears’ as perceptual experiences because they are not caused by stars and a ringing noise but by some kind of damage (or disturbance) to the visual and auditory receptors respectively. Hence, when pain arises from damage to nociceptors, there is a *prima facie* reason to discount it as a veridical representation. If nociception is akin to a paradigmatic perceptual modality, the pain that occurs when the body has been damaged by the candle, which is no longer present, would misrepresent the presence of the extreme intensity of stimuli that are bad for us.

In Cutter & Tye’s view, the pain that is caused by damage to the nociceptors would, presumably, represent local tissue damage as being bad for us. Although the representation of pain’s objects is no longer realized by the stimulation of nociceptors, it might be argued that the

assumption that the representation of pain's objects must be so realized can be challenged. After all, bodily damage is rather different from the objects represented by paradigmatic perceptual experiences. Since bodily damage is not associated with particular physical or chemical phenomena, it might require unusual means of representation. For Cutter & Tye, optimal conditions are those that a representational system was designed to operate in by natural selection or by some analogous process in the course of ontogenic development. Could it be that the damage done to nociceptors was the mechanism selected by evolution by which the presence of tissue damage and its badness for us came to be represented?³⁴

It is uncontroversial that we come to know when the body has been damaged from the pain that we experience. And it may seem uncontroversial that it would be to our advantage to be able to come to know when the body has been damaged, so that we might be able to respond to the damage.³⁵ However, there is an alternative explanation of how we come to know that the body has been damaged that does not require an experience of it. Consider how we learn about the paradigmatic perceptual modalities, and what has gone wrong with them, from the presence of anomalous experiences (e.g. 'seeing stars' and 'hearing a ringing') in those modalities. The damage caused to the perceptual mechanisms is not represented in having such experiences. It is inferred from the experiences. Relatedly, when pain is caused by damage to nociceptors, it provides a similar basis from which we can come to know that the body has been damaged. But the damage would

not be represented in having such experiences; it would be inferred from them.

Perhaps an even more significant issue is whether the presence of the pain that occurs after a part of the body has been damaged enables us to respond to the bodily damage in a way that is to our advantage. Since the damage has already been done, there is one evident respect in which the pain is no longer of benefit: as protection of the body from damage. But it might be held that the pain experience that follows bodily damage serves to protect the body from further damage or acts as the means by which we are motivated to repair the body.

Although there is no doubt some plausibility in this, there are also compelling examples for which a protective role or a reparative role for pain experience is hard to accept. Cancer often leads to pain, initially through the activation of nociceptors contiguous to the cancer, but subsequently by modification of and damage to the nociceptors. The pain caused in this way does not enable a behavioural response to the damage caused by the cancer. Under the conditions in which pain was selected, it does not enable us either to protect the body or to repair the body. What this shows is that bodily damage can cause pain that is dysfunctional rather than functional.³⁶ There is little reason to think that the case of cancer is unusual in this respect. If the pain experiences caused when nociceptors are damaged are dysfunctional in the case of cancer, we have reason to think that the pain experience that occurs when nociceptors are damaged in other ways, such as when the skin is burnt, are also dysfunctional.

Given the problems associated with the claim that the pain experience caused by bodily damage instantiates TTI, representationalists would be advised to take seriously the proposal that at least some of the pain that is caused by bodily damage is not an adaptive response to bodily damage, but an aspect of the damage.³⁷ However, this cannot be the whole story.

5. Bodily Damage and Pain

Although there is reason to think that some of the pain that follows bodily damage is dysfunctional, there is also reason to think that much of the pain that follows bodily damage plays a role in the repair and recovery of the body from damage. It may be tempting to use this as a reason to seek a comprehensive explanation for pain that relates it to bodily damage. However, there is an explanation of the way in which the pain experience that follows bodily damage can contribute to the reparative response that fits neatly with the alternative view of the content of pain experience proposed here. The central idea is again that reparative pain experience does not represent bodily damage because bodily damage does not instantiate TTI. In the case of reparative pain, bodily damage is necessary but insufficient for pain experience. Pain is not caused by bodily damage; it is merely *enabled* by bodily damage. Necessary, and sufficient for pain in the circumstances, and its cause, is the extreme intensity of stimuli that are bad for us. It is, therefore, the

extreme intensity of stimuli that are also, typically, represented by reparative pain.

The most prominent advocate of the view that pain experience is reparative is Colin Klein, who has recently claimed that the reparative role of pain is biologically the most essential role of pain. Indeed, he goes as far as to claim that '[p]ains that accompany recovery are the most prevalent, and arguably the most important, of the pains, we feel. [...] The pain of a single sprained ankle will last longer than the total duration of all the pinpricks I will feel.'³⁸ It is reparative pain that motivates Klein to claim that it is not the role of pain to represent bodily damage but to protect the body. This, in turn, provides him with the basis for his view that imperatives are the way in which that protective role is realized. However, representationalism can account for reparative pain in a straightforward way on the view that pain is not the representation of bodily damage but the representation of the badness for us of the extreme intensity of noxious stimuli. Furthermore, this modified version of representationalism provides a plausible story of how reparative pain arises.

To understand that story some background is needed. As soon as a part of the body is damaged a reparatory response is initiated. It involves: (1) changes in blood flow and permeability of blood vessels that allow white blood cells and proteins to circulate in the vicinity of the tissue damage and thereby to remove damaged tissue and to protect the body from infection; (2) swelling to stabilize the damaged tissue; and (3) sensitization of nociceptors through the binding of protein molecules to the nerve endings.³⁹

The sensitization of nociceptors may be counted against the view of pain experience as a representation of bodily damage in so far as it tends to make it more difficult to locate the precise source of damage from the pain experience. But the theoretical implications of nociceptor sensitization go beyond that. Sensitization of nociceptors is not activation of nociceptors. As such, bodily damage is insufficient for much of the pain experience following bodily damage. Nevertheless, bodily damage is, at least in the present context, necessary for pain experience. Bodily damage enables such pain experience. No doubt we come to know that the body is damaged from the pain we feel in such circumstances. But we do not represent the damage in pain experience; we infer the damage from the pain we feel, which we would not normally feel.

Nociceptor sensitization has the consequence that the intensity of stimulation, which, in normal circumstances, would not have caused the activation of nociceptors, is able to do so. In effect, the sensitization of nociceptors has the upshot of increasing the class of stimuli whose intensity is represented as being bad for us. And that is exactly how it should be. Stimuli whose intensity is not normally bad for us become bad for us when a part of the body is in the process of repairing itself from damage.⁴⁰ Contrary to Klein, this suggests that reparative pain is not the primary role of pain but is dependent on the existing role that pain has to represent the presence of stimuli that are bad for us.

Consider Klein's example of the sprained ankle. He suggests that the content of the pain that accompanies the sprain is an imperative to protect the ankle by keeping weight off it. According to the

representationalist account proposed here, the pain that is caused when one puts weight on the ankle is an exteroceptive experience of the extreme intensity of stimuli that are bad for one impinging on the ankle when one puts weight on it. Normally such stimuli are innocuous. It is only when the ankle has been damaged and is in the process of repairing itself that they are bad for us. Only then do we need to determine their presence and respond to them. The negative affective character of the pain both determines the presence of stimuli that are now bad for us and motivates a response to them. The simplest response in the circumstances is to stop putting weight on the ankle. It may seem that the pain represents bodily damage because we come to know that the ankle is still damaged when we put weight on it. But we come to know this by inference; from the fact that the intensity of such stimuli does not normally cause us pain.

The pain of a sprained ankle not only occurs when one puts weight on it. Sometimes it occurs when one just flexes the ankle. The pain that is caused when one flexes a sprained ankle can be explained as an interoceptive experience of the extreme intensity of stimuli that are bad for one impinging on the ankle when one flexes it. The simplest response to the pain so caused is to stop moving the ankle. But the opposite is required when someone else touches the ankle. The appropriate response to that is to remove the ankle from the contact. Any account of reparative pain should give an explanation why pain leads us to protect the body in the different ways in which it does. An account of pain as the exteroceptive or interoceptive experience of the intensity of stimuli that is bad for us when a part of the body is damaged

does just that. Indeed, it is hard to see how any other account could explain the specific responses that pain enables in such circumstances in such a straightforward way.

There is, however, one potential objection to such an account: pain is sometimes continuous. Such pain experiences do not in these cases seem to be responses to stimuli that are bad for us and to which an appropriate response can be made. Continuous pain following bodily damage may have a number of causes. It may result from the swelling that serves to stabilize the injury generating continuous pressure on nociceptors. Or it may result from some of the proteins circulated in the reparatory response to bodily damage being not merely necessary but sufficient for nociceptor activation. However, in these two cases it is well established that the causes of pain have been selected because they have other functions related to the repair of the body. In these cases, it is plausible to think that the continuous pain so caused is merely a side effect of the body's reparative response. After all, what would be the point of pain that is not responsive to any responses we could make to its presence?

6. The Messenger-Shooting Objection

To summarise and to add some final support to the view of pain proposed here, I conclude by showing how it provides a new perspective on and response to an objection to the representationalist account of

pain experience that has recently received a good deal of attention: the messenger-shooting objection.⁴¹

According to the story, a ruler orders the shooting of a messenger of bad tidings. Quite apart from the ruler's moral failings, it is irrational for him to order the shooting of the messenger. Merely delivering a message does not merit such a response. What matters are the bad tidings the messenger carries. The messenger shooting objection to representationalism claims that the representationalist account of pain is problematic in an analogous way. According to the objection, since representationalism holds that pain experience is the representation of bodily damage and its badness for us, what matters to us should be the contents of the message that pain carries; the pain experience merely delivers the message. When we respond to pain by seeking to eliminate the pain, rather than address the bodily damage that is bad for us, as we often do, we would thereby be responding irrationally. Yet, so the objection goes, we are clearly not responding irrationally to the pain we feel by seeking to eliminate it. Hence there is something wrong with the representationalist account. The analogy is supposed to draw attention to the failure of the representationalist account to explain (satisfactorily) what it is about the representation of what is bad that explains why pain feels bad and motivates action. According to the version of representationalism developed here, the objection draws attention to something else.

Cutter and Tye, in their reply to Jacobson's version of the messenger shooting objection, note that there is a reason for responding to pain even without responding to its contents that challenges the

analogy: pain can be instrumentally bad for us. That is right but not in a way that removes the problems for Cutter and Tye's representationalist account. For, if it is rational to seek to eliminate pain without eliminating the bodily damage that it is supposed to be the function of pain to represent, it is now open to question whether this is in fact the function of pain.

The view developed in this paper chimes with the supposed concerns raised by the messenger shooting analogy (that there is more to the explanation of the negative affective character of pain and its motivational force than reference to the representation of bodily damage) and at the same time addresses the further issues raised by the objection. In §2 reasons were given to think that the content of pain experiences is typically the extreme intensity of noxious stimuli and its badness for us. In §3 reasons were then given to think that something more than the representation of the extreme intensity of noxious stimuli as bad for us is required to explain the negative affective character of pain. What is required is a mode of presentation of such content. But this would only be enough to explain why pain has its distinctive negative affective character in conjunction with another function that pain serves: to motivate the removal of the noxious stimuli that typically pain represents. On the representationalist approach recommended here, there is an explanation for why the representation of what is bad for us should feel bad to us.⁴²

A further upshot of the present approach is that it provides a better reason to think that the messenger shooting analogy is inappropriate. As discussed in §4, if the proper function of pain is to

represent the extreme intensity of noxious stimuli, then the situation arises in which it is plausible to think that at least some of the pain that follows bodily damage is better explained as an aspect of the bodily damage rather than a response to bodily damage. In short, it is because pain feels bad to us that we have a reason to eliminate it, but it is because pain feeling bad to us can be dysfunctional for us that we have a reason to eliminate it by medical intervention.

Significantly, none of the reasons given for eliminating pain without addressing its contents are appropriate when, under normal circumstances, pain experience represents the extreme intensity of noxious stimuli. Indeed, we would not, or should not, seek to eliminate pain without addressing its contents in those circumstances. After all, it is the pain experience that makes possible the determination of the presence of stimuli that are bad for us, and also provides the motivation to get rid of them by motivating us to get rid of the pain. If we got rid of the pain experience by medical interventions, our bodies would be open to all sorts of dangers.⁴³ The messenger shooting objection to representationalism does not provide an objection to representationalism as formulated in this paper. It rather seeks to provide an objection to a representationalist approach to pain that this paper has argued should be rejected on other grounds.⁴⁴

Philosophy

Cardiff University

NOTES

¹ For discussion of the negative affective character of pain see Cutter & Tye, 2011; for discussion of the motivational nature of pain see Cutter & Tye, 2014. See also Bain, 2013 and forthcoming.

² Cutter & Tye, 2011, p.91.

³ I adopt the terminology of a ‘valuational property’ from Cutter & Tye to refer to the property that is attributed in experience when something is represented as *bad* for us.

⁴ Representationalism about pain experience faces other challenges. For instance, imperativists (see Klein, 2015) argue that the motivational capacity of pain is better explained by imperativ content than representational content. A further aim of the present paper is to address the kind of objections to representationalism that can lead to such a view.

⁵ Cutter & Tye, 2011, p. 91.

⁶ Cutter & Tye, 2011, p. 92. Somewhat more specifically, it is caused by damage or disturbance ‘of a certain shape, volume and intensity, as well as a certain quality (whether it is caused thermally, mechanically or chemically).’

⁷ Cutter & Tye 2011, p. 92. In construing pain experience as a type of perceptual experience they follow a longstanding tradition according to which pain experience is a form of interoception that determines when a part of one’s body is in a *bad state*, not a form of exteroception that determines the presence of objects outside the body in the way that the paradigmatic exteroceptive modalities of vision, audition, olfaction, gustation and touch do. The perceptual approach has been developed in a variety of ways in line with the variety of approaches to perception more generally. See Pitcher, 1970 and Newton, 1989, for two contrary such approaches.

⁸ Cutter & Tye 2011, pp. 99-100.

⁹ Strictly speaking, experiences represent things, like damage or disturbance, by representing their properties. The present point applies at the level of properties. Damage and disturbance are, presumably, differentiated by their properties. Hence they are not quite sure exactly which properties are tracked by pain experience.

¹⁰ Tye, 1995, p. 194.

¹¹ See Perl & Kruger, 1996, for a review of recent research and Lynn & Perl, 1996, for experimental details. A variety of types of nociceptor have been distinguished that are individuated by the range of energy types to which they are sensitive. This is not to ignore the challenge to specificity theories of pain raised by Melzack & Wall, 1982. Nothing in their challenge undermines the claim that nociceptors play an essential role in the detection of noxious stimuli.

¹² Pain experiences can be caused in the absence of such stimuli. That can be explained by the absence of optimal conditions. However, sometimes such stimuli are insufficient for pain experience. This is a key element in the attack on specificity theories of pain by Melzack & Wall. However, these situations are also unusual and so would be a contentious way to reject the representationalist approach, as, for instance, Klein, 2015, seeks to do. Indeed, the evolution of a gating system posited by Melzack & Wall is consistent with the representationalist position proposed here according to which non-optimal circumstances arise when nociceptors are damaged.

¹³ Grice, 1962.

¹⁴ See Gray, 2014, for a defence of the intensive theory of pain. Although this exteroceptive view of pain experience is uncommon in philosophy, it is not uncommon in psychology.

¹⁵ Exactly how heat perception is to be understood has received remarkably little detailed attention and is often misconstrued. See Gray, 2013, for some of the complexities involved and an argument that heat perception determines the energy transmitted to (heat sensations) and away from (cold sensations) the body. Once it is accepted that heat sensations represent the energy transferred to the body, it is not a large leap to appreciate how pain sensations could represent the extreme intensity of stimuli impinging on the body.

¹⁶ The variety of types of pain experiences may be explained, at least in part, by reference to the variety of perceptual experiences by which they are accompanied.

¹⁷ See Lynn & Perl, 1996, for studies determining the receptivity of nociceptors.

¹⁸ Klein, 2015, chap. 3, claims that pain is homeostatic, i.e. it enables the body to recover to a stable state. A problem with this claim is that pain can allow us to address noxious stimuli without any relevant change to the body having taken place.

¹⁹ See Klein, 2015, pp. 29-31 who, citing P. D. Wall, claims that such considerations should persuade us to reject a representationalist approach.

²⁰ For instance, consider the importance of being able to detect insect bites and stings.

²¹ As a referee points out, I do not directly address cases of pain, such as stomach aches and headaches, which seem to require a somewhat different explanation. I do not claim the general approach proposed here to apply without exception. Nevertheless, I suspect some cases of stomach aches and headaches could be informed by this approach.

²² Klein, 2015, p. 1-3.

²³ This does not exhaust the types of pain that we can experience. Nevertheless, it includes many instances of pain. And those pain experiences that do not seem to fit easily here do not show that the explanation is not adequate to many cases of pain experience.

²⁴ See Bain, 2014, for instance.

²⁵ See Klein, 2015, chap.11, for a view of asymbolia that challenges the distinction between sensory and affective components.

²⁶ A referee for this journal pressed me for my account of how the specific content of experience of extremely intense stimuli is supposed to feature in the character of pain experience of it. I am grateful to them for making me think about this further.

²⁷ That is why pain experiences have been selected.

²⁸ The case for phenomenal modes of presentation has been made perhaps most prominently by Chalmers, 2004, who draws a parallel between Fregean senses in the philosophy of language and phenomenal modes of presentation in the philosophy of perception. It is this that I have in mind here. See also Kriegel, 2013.

²⁹ Bain, 2013.

³⁰ See the discussion in Jacobson, 2013, section four. In the philosophy of perception, experience is *transparent* if, metaphorically speaking, one sees through an experience to its object. This is the notion of *transparency* that I have in mind here when I claim that pain experience lacks it. For reasons to think pain is not a transparent experience see Aydede, 2009.

³¹ Aydede, 2009, objects that representationalist accounts of pain do not explain the way in which the experience of pain is more akin to introspection than interoception. I am sympathetic to the objection. A non-reductive version of representationalism of the sort proposed here that recognizes the multiplicity of functions of pain seems to me better equipped to address the challenge.

³² Other approaches, such as imperativism and desire theoretic accounts do the same, *mutatis mutandis*.

³³ In so far as the negative affective character of pain can be explained by the function pain has, it is only an explanation of pain at the personal level. There are no doubt various functional processes that underlie the presence of pain experience at the sub-personal level. It is a further substantive issue how the personal level and sub-personal level functions of pain are related.

³⁴ This might also focus attention on what the general object of representation of pain experience could be.

³⁵ Klein, 2015, argues powerfully that evolutionary pressures are not best met by the representation of tissue damage.

³⁶ That some pain is dysfunctional provides one reason for the evolution of a gating system.

³⁷ The pain following damage to nociceptors is not only a challenge to representationalist accounts of pain; it is a challenge to any account of pain. For instance, an imperativist account might claim that the pain following damage to nociceptors can be explained as an imperative to protect the body. That there is nothing that the individual can do to protect the body from cancer suggests that pain is not best understood as such a command. I take it that pains so caused are more plausibly construed as dysfunctional.

³⁸ Klein, 2015, p. 4.

³⁹ For more details see Melzack & Wall, 1982, chap.5.

⁴⁰ If stimuli that are not normally extremely intense become sufficiently intense to be bad for us, and thus to be represented as bad for us, the question arises of whether their extreme intensity is or could be represented in distinctness from their badness for us, which would bear on the discussion at the start of §3.

⁴¹ See Jacobson, 2013, for a statement and discussion of the problem.

⁴² A referee for this journal points out that an advocate of the messenger shooting objection to representationalism might not be satisfied with this response. They might reply that no explanation has been given for why the role played by pain could not have been played by an experience that lacked the negative affective character of pain. In response, one could reject the putative possibility either as inconceivable or, if conceivable, as impossible. The ground here is well trodden in other contexts.

⁴³ This is exactly what happens in cases of congenital analgesia.

⁴⁴ Thanks to audiences at the University of Glasgow, the University of Southampton and Cardiff University for feedback on earlier versions of this material. Thanks especially to David Bain and Jennifer Corns for extended discussions on the nature of pain. Thanks to the anonymous referees for this journal for their advice on the penultimate draft.

REFERENCES

- Aydede, M. (2009). 'Is pain the perception of something?' *Journal of Philosophy* 106, pp. 531-567.
- Bain, D. (2013). 'What makes pains unpleasant?' *Philosophical Studies* 116, pp. 69-89.
- Bain, D. (2014). 'Pains that don't hurt', *Australasian Journal of Philosophy* 92 (2), pp. 305-320.
- Bain, D. (forthcoming). 'Why take painkillers?', *Noûs* <https://doi.org/10.1111/nous.12228>.
- Chalmers, D. (2004). 'The representational character of experience,' in B. Leiter (ed.) *The Future for Philosophy*. Oxford: Oxford University Press.
- Cutter, B. & Tye, M. (2011). 'Tracking representationalism and the painfulness of pain,' *Philosophical Issues* 21, pp. 90-109.
- Cutter, B. & Tye, M. (2014). 'Pain and reasons: Why it is rational to kill the messenger,' *The Philosophical Quarterly* 64 (256), pp. 423-433.
- Gray, R. (2013). 'What do our sensations of heat and cold represent?' *Philosophical Studies* 166 (S1), pp. 131-151.
- Gray, R. (2014). 'Pain, perception and the sensory modalities: Revisiting the intensive theory,' *Review of Philosophy and Psychology* 5 (1), pp. 87-101.
- Grice, H. P. (1962). 'Some remarks about the senses,' in *Analytical Philosophy*, Series 1, R. J. Butler (ed.), Oxford: Blackwell.

- Jacobson, H. (2013). 'Killing the messenger: Representationalism and the painfulness of pain,' *The Philosophical Quarterly* 63 (252), pp. 509-519.
- Klein, C. (2015). *What the Body Commands*. Cambridge (Massachusetts): Massachusetts Institute of Technology Press.
- Lynn, B. & E. R. Perl. (1996). 'Afferent mechanisms of pain,' in L. Kruger, M. Friedman & E. Carterette, (eds) *Pain and Touch*. Cambridge (Massachusetts): Academic Press, pp. 213-241.
- Kriegel, U. (2013). 'The phenomenal intentionality research programme,' in U. Kriegel (ed.) *Phenomenal Intentionality*. Oxford: Oxford University Press.
- Perl, E. R. & Kruger, L. (1996). 'Nociception and pain: Evolution of concepts and observations,' in L. Kruger, M. Friedman & E. Carterette, (eds) *Pain and Touch*. Cambridge (Massachusetts): Academic Press, pp. 179-211.
- Pitcher, G. 1970. 'Pain perception,' *Philosophical Review* 79, pp. 368-393.
- Melzack, R. & Wall, P. (1982). *The Challenge of Pain*, Harmondsworth: Penguin Books.
- Newton, N. (1989). 'On viewing pain as a secondary quality,' *Noûs* 23, pp. 569-598.
- Tye, M. (1995). *Ten Problems of Consciousness*. Cambridge (Massachusetts): Massachusetts Institute of Technology Press.