# Abduction, Perception, Emotion, Feeling: Body Maps and Pattern Recognition

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## 1. *Introduction*

In this paper, we compare some views on emotion of William James, C. S. Peirce, and Antonio Damasio, in relation to our epistemological hypothesis about what it is to *feel an emotion*: that it is in effect an abductive process of recognizing patterns in one's bodily states, and thereby updating the maps in one's brain of one's body and its states. Although abduction is a type of inference, while in feeling an emotion one does not strictly make an inference, the underlying unconscious process still has an abductive structure. In that respect, feeling an emotion resembles *insight*, according to Peirce. Thus feeling an emotion is already subject to epistemological assessment, before the subject has even started to classify her emotions reflectively.

Damasio's account develops out of James' theory of emotion, but also represents a substantial revision of it. We will explain how Damasio's modern neurological view is structurally closer to Peirce's view than to James', even though Damasio does not refer to Peirce. In particular, the abductive view must distinguish *what* is recognized from the recognizing of it, which for Damasio are the emotion and the feeling respectively; by contrast, James makes no such distinction.

An immediate qualification is needed: emotions normally come with *objects*, or at least *contents*, irreducible to the subject's internal bodily states or processes, since they also depend on the subject's external environment, constitutively as well as causally. For instance, when one fears, one normally fears *something*, at least in the sense that one's fear has a content. For simplicity, consider the case of fearing an object. Imagine Alice encountering Tweedledum without learning his name or that he has an identical twin. He does something to frighten her. Alice fears Tweedledum, though of course in articulating her emotion she has to refer to him using a visual demonstrative rather than his name: she says "I fear him!", not "I fear Tweedledum!". She does not fear Tweedledee, of whose existence she is completely unaware. Had she met him instead, in exactly the same circumstances, her bodily states and processes would have been exactly the same too, but she would have feared Tweedledee and not feared Tweedledum. Thus no bodily state or process is both necessary and sufficient for fearing Tweedledum. A parallel argument applies to *feeling* emotions. No bodily state or process is both necessary and sufficient for feeling fear of Tweedledum. However, that point granted, some bodily state or process may still be both necessary and sufficient for the general property of fearing, or for the general property of feeling fear.

In this paper, we work on the assumption that such more general emotion types have at least distinctive connections with bodily states or processes. Clearly, a full account of

emotions must reintegrate their bodily and referential aspects; we make no attempt on that task here.

## *2. James*

The first physiological account of the nature of emotion is usually said to be that of William James, in his paper 'What is an Emotion?' A famous passage contrasts his view with that of the folk (1884: 189-90, James' emphases):

> Our natural way of thinking […] is that the mental perception of some fact excites the mental affection called the emotion, and that this latter state of mind gives rise to the bodily expression. My thesis on the contrary is that *the bodily changes follow directly the* PERCEPTION *of the exciting fact, and that our feeling of the same changes as they occur* IS *the emotion*.

He illustrates the contrast: 'Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike', whereas 'the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike or tremble, because we are sorry, angry, or fearful, as the case may be' (ibid.). James admits that his view has a 'paradoxical character' on first hearing, but argues that it is supported by a variety of observations, some scientific, some ordinary. For example, 'Everyone knows how panic is increased by flight, and how the giving way to the symptoms of grief or anger increases those passions themselves'; 'Refuse to express a passion, and it dies' (1884: 197).

A quick reading might yield the impression that James contrasts his view with common sense formally as 'X because Y' against 'Y because X'. However, that is not strictly what he says. For instance, his 'more rational statement' is 'we feel sorry because we cry', which he contrasts with 'we cry […] because we are sorry'; likewise in the other cases. Thus the explicit contrast is between James' 'we feel E because we A' and common sense's 'we A because we are E', where for instance E = 'sorry' and A = 'cry'. There is no obvious reason to equate *feeling* sorry with *being* sorry. After all, in principle one can feel healthy without being healthy, and one can be healthy without feeling healthy; one can feel alert without being alert, and one can be alert without feeling alert. Similarly, a sentimental but unrepentant criminal may *feel* sorry for his victims without *being* sorry for them; he cries for them but makes no attempt to compensate them. A repentant but business-like criminal may *be* sorry for his victims without *feeling* sorry for them; he compensates them but is not inclined to cry for them. Again, it is possible to *be* afraid without *feeling* afraid: the authors know of a healthy young Dutch resistance fighter in World War Two being led out by the Germans, he assumed to face a firing squad: to his surprise he felt unafraid, but then looked down and saw that he had wet himself.[1] It is also possible to *feel* afraid without *being* afraid: in the presence of a spider, one might interpret artificially induced physiological symptoms as fear, feel afraid of the spider, and infer that one had recently developed arachnophobia, while

acting towards the spider in ways which made sense only for someone with no fear of spiders.[2]

The shift from 'be E' to 'feel E' is not mere sloppiness on James' part, for his emphasis is on the feeling. The passage continues (1884: 190, his italics):

> Without the bodily states following on the perception, the latter would be purely cognitive, pale, colourless, destitute of emotional warmth. We might then see the bear, and judge it best to run, receive the insult and deem it right to strike, but we could not actually *feel* afraid or angry.

James' italicization might seem implicitly to contrast *feeling* afraid or angry with *being* afraid or angry, where the latter are in themselves cold, unemotional cognitive states or perceptions. However, James' overall argument does not allow for such a distinction. The passage presupposes that we *do* feel afraid or angry. Since 'What is an Emotion?' focuses on the feeling of bodily changes, with no suggestion that two sets of feelings are in play, James means that to feel afraid or angry *is* in effect to feel a bodily change. Thus, given his claim that '*our feeling of the* [*bodily*] *changes as they occur* IS *the emotion*', and that he treats fear and anger as emotions, he is implicitly identifying being afraid or angry with feeling afraid or angry.

James is not stipulating new technical meanings for the vocabulary of emotion. He does not warn readers of any redefinition, and his arguments rely on their pre-theoretic understanding of his words. This comes out in his well-known thought experiment in support of the necessary connection between emotion and bodily feeling (1884: 193):

> If we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its characteristic bodily symptoms, we find we have nothing left behind, no "mind-stuff" out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains.

The thought experiment is intended to appeal to the folk: James supports it by saying 'most people, when asked, say that their introspection verifies this statement'. Though he admits that some insist otherwise, he suggests that they do not understand the question (ibid.). The thought experiment assumes it to be pre-theoretically clear that an emotion is not 'a cold and neutral state of intellectual perception'.

In effect, James ignores the ordinary distinction between *being* afraid or angry and *feeling* afraid or angry. He philosophized in ordinary language but he was no ordinary language philosopher. We can state his view in more abstract terms, thus: the perception of an excitatory fact causes bodily changes, which the subject perceives, and that perception is the emotion.

## *3. Peirce*

Like James, and much earlier than 'What is an Emotion?', Peirce drew a close connection between emotions and feelings of bodily change or motion (1868: 150-1 = 1931-35: 5.292-4). He lists 'blushing, blenching, staring, smiling, scowling, pouting, laughing, weeping, sobbing, wriggling, flinching, trembling, being petrified, sighing, sniffing, shrugging, groaning, heartsinking, trepidation, swelling of the heart, etc., etc.' and 'other more complicated actions, which nevertheless spring from a direct impulse and not from deliberation'.[3] Peirce does not treat the connection with bodily motion as exclusive to emotion, for 'There is some reason to think that, corresponding to every feeling within us, some motion takes place in our bodies', and some feelings are mere sensations, which are not emotions. Rather, he distinguishes the bodily movements corresponding to emotions as more complex and 'large' than those corresponding to 'sensations proper'.

Like James, Peirce assumes that there is no emotion without feeling. For example, without comment he subsumes being angry as a case of feeling (1868: 150 = 1931-35: 5.292). Unlike James, Peirce does not downplay the overt cognitive content of emotions, which he calls their 'subject' and we might now call their 'intentionality'.[4] More generally, he holds that there is no feeling without content, and he supports that claim by in effect arguing from the premises that (1) if there are feelings without content, they are emotions and (2) there are no emotions without content. Here is his argument for (2) (1868: 150 = 1931-35: 5.292, Peirce's emphases):

> Now every emotion has a subject. If a man is angry, he is saying to himself that this or that is vile and outrageous. If he is in joy, he is saying "this is delicious." If he is wondering, he is saying "this is strange." In short, whenever a man feels, he is thinking of *something*. Even those passions which have no definite object – as melancholy – only come to consciousness through tinging the *objects of thought*.

In the same passage, he connects emotion with cognitive difficulty:

> The emotions, as a little observation will show, arise when our attention is strongly drawn to complex and inconceivable circumstances. Fear arises when we cannot predict our fate; joy, in the case of certain indescribable and peculiarly complex sensations.

Although emotion as such was not a major theme in Peirce's philosophy, his later work contains some significant remarks on it, which continue to emphasize its bodily aspect.

In a work of 1902, Peirce claims that 'An emotion is directly felt as a bodily state, or else it is only known inferentially', as a special case of his general principle that 'Not the smallest fact about the mind can be directly perceived as psychical' (1931-35: 1.250). Presumably, for Peirce, the common phrase 'feel angry' is misleading, since it suggests that one can directly feel an emotion as a psychical state. One might be tempted to read him as identifying the bodily state with the emotion, presented in bodily guise, and so as implicitly

allowing the emotion to occur without the feeling. For to say that an emotion is directly felt as a bodily state is not to say that it *is* the feeling of the bodily state. Rather, a felt bodily state could in general have occurred without being felt: I feel my tongue touch my teeth, but under a local anaesthetic the contact could have occurred without the feeling. However, the rest of the passage does not corroborate such a reading. On an alternative interpretation, Peirce (unlike James) is treating the bodily state felt and the feeling of it as two parts of something more complex, the emotion. That would be consistent with his earlier assumption that there is no emotion without feeling.

Despite the similarities, Peirce's account of emotion has a highly distinctive feature quite absent from James': Peirce applies his category of *abductive* reasoning to emotion, as he does to sensation and perception too. To explain how he does so, we must first briefly rehearse his account of reasoning.

From early in his career, Peirce distinguished what he first called *hypothesis* from both *deduction* and *induction* as forms of reasoning. Later, he coined the term 'abduction' to replace 'hypothesis' for the sake of morphological homogeneity. In a deductively valid argument, whenever the premises are true, so is the conclusion. Normally, an inductive or abductive argument is not valid in that case: in some cases, the premises are true while the conclusion is false. Nevertheless, such an inductive or abductive argument may still be valid in a slightly watered-down sense. As Peirce put it (1931-35: 5.267), 'the process of valid inference […] proceeds from its premiss, A, to its conclusion, B, only if, as a matter of fact, such a proposition as B is always or usually true when such a proposition as A is true'. There may also be a quasi-deductive connection in the opposite direction: at least when combined with background auxiliary assumptions, the conclusion of an inductive or abductive argument may entail the premises.

Peircean abduction differs from induction as well as from deduction. Inductive reasoning projects a pattern from the observed to the unobserved, but formulated in the very same terms: from the premise that various emeralds were green, one draws the conclusion that emeralds are always green. By contrast, abductive reasoning introduces a new idea: the conclusion contains a term not present in the premises. For example, it may postulate a microscopic chemical structure for emeralds to explain why they are green. Such explanatory hypotheses are characteristic of serious scientific inquiry, for which induction is inadequate.[5]

Of course, the mere converse deductive relation of the conclusion plus auxiliary assumptions to the premises does not suffice to make abductive reasoning valid even in the watered-down sense. For many mutually inconsistent potential conclusions may share that feature, even once those inconsistent with the evidence and auxiliary assumptions have been eliminated. To narrow the gap, other explanatory virtues are normally required of the abductive conclusion, such as simplicity and unifying power. Peirce sometimes connected those virtues to the requirement of introducing a new idea by characterizing a process of substituting one simple predicate in the conclusion for 'a highly complicated predicate' in the premises. The substituting predicate has both simplicity and unifying, explanatory power; it also introduces a new idea. Peirce explicitly compared emotions to scientific hypotheses in that respect. In emotion, as in sensation and perception, and in the move to a scientific hypothesis, a simple predicate is substituted for a highly complicated predicate (1868: 150-1 = 1931-35: 5.292-4). Thus an emotion is felt in a process with abductive structure.

Peirce associates his threefold logical distinction amongst forms of reasoning with 'an important psychological or rather physiological difference in the mode of apprehending facts' (1878: 482 = 1931-35: 2.643). He claims that abduction (hypothesis) 'produces the *sensuous* element of thought', induction 'the *habitual* element', and deduction 'the *volitional* element' (his emphases). Elsewhere, he elaborates the threefold correlation between logical and psychological categories thus (1931-35: 2.712):

> Deduction proceeds from Rule and Case to Result; it is the formula of Volition. Induction proceeds from Case and Result to Rule; it is the formula of the formation of a habit or general conception--a process which, psychologically as well as logically, depends on the repetition of instances or sensations. Hypothesis proceeds from Rule and Result to Case; it is the formula of the acquirement of secondary sensation—a process by which a confused concatenation of predicates is brought into order under a synthetizing predicate.

This is all in line with Peirce's methodological dictum that 'we must, as far as we can, without any other supposition than that the mind reasons, reduce all mental action to the formula of valid reasoning' (1931-35: 5.267).

Peirce warns against treating the reasoning process as fully conscious or purely theoretical (1931-35: 2.711):

> The cognition of a rule is not necessarily conscious, but is of the nature of a habit, acquired or congenital. The cognition of a case is of the general nature of a sensation; that is to say, it is something which comes up into present consciousness. The cognition of a result is of the nature of a decision to act in a particular way on a given occasion.

In similar vein, he writes (1931-35: 5. 268):

> But does the mind in fact go through the syllogistic process? It is certainly very doubtful whether a conclusion -- as something existing in the mind independently, like an image -- suddenly displaces two premisses existing in the mind in a similar way. But it is a matter of constant experience, that if a man is made to believe in the premisses, in the sense that he will act from them and will say that they are true, under favourable conditions he will also be ready to act from the conclusion and to say that that is true. Something, therefore, takes place within the organism which is equivalent to the syllogistic process.

For abduction, the psychological connection centrally involves emotion. Here is Peirce's account of the psycho-physiological aspect of abduction (1878: 482 = 1931-35: 2.643):

> Hypothesis substitutes, for a complicated tangle of predicates attached to one subject, a single conception. Now, there is a peculiar sensation belonging to the act of thinking that each of these predicates inheres in the subject. In hypothetic inference this complicated feeling so produced is replaced by a single feeling of greater intensity, that belonging to the act of thinking the hypothetic conclusion. Now, when our nervous system is excited in a complicated way, there being a relation between the elements of the excitation, the result is a single harmonious disturbance which I call an emotion. Thus, the various sounds made by the instruments of an orchestra strike upon the ear, and the result is a peculiar musical emotion, quite distinct from the sounds themselves. This emotion is essentially the same thing as an hypothetic inference, and every hypothetic inference involves the formation of such an emotion.

Thus, remarkably, Peirce manages to identify abduction and emotion—one might say, as much by warming abduction as by cooling emotion.

In such passages, far from treating physiological and cognitive accounts of emotion as in competition against each other, Peirce combines them as describing different aspects of the same inferential process. After all, a psychological process of reasoning has both logical and causal structure. The premises and conclusion have content, and stand in logical relations to each other, but it is not genuine reasoning unless the reasoner's acceptance of the conclusion also depends causally on their acceptance of the premises (where acceptance may consist in belief or be merely for the sake of argument). Both the acceptance and the causal dependence are psychological matters, presumably with some neurophysiological basis.

One may wonder at the idea that a scientist making a routine abductive inference is, in the very nature of the process, thereby forming an emotion. But Peirce is focusing on the moment of insight, your experience when a new idea first strikes: you 'see it'. The analogy with vision is natural, and already implicit in the etymology of 'insight'. Peirce makes it explicit: he describes perceptual judgment as the 'limiting case' of abductive judgment (1931-35: 5.186), and says that he calls something an 'insight' 'because it is to be referred to the same general class of operations to which Perceptive Judgments belong' (1931-35: 5.173). He explains what unifies that class: 'All that I can mean by a perceptual judgment is a judgment absolutely forced upon my acceptance, and that by a process which I am utterly unable to control and consequently am unable to criticize' (1931-35: 5.157). Abductive insights are involuntary because one cannot decide or intend to entertain the hypothesis that P without already entertaining the hypothesis that P. Like abduction and perception, emotion is involuntary: one cannot switch misery or joy on or off at will.

If the term 'emotion' still seems to be a stretch, one may observe that, in the quoted passage, Peirce's wording sounds a warning note to the reader, when he chooses the first person singular 'which I call an emotion' over the impersonal 'which is called an emotion'. It suggests that he may be applying the word 'emotion' somewhat idiosyncratically, presumably as a technical term in order to cut at what he takes to be the theoretically significant joints. We should not be surprised if he is willing to apply it in some respects much more broadly or more narrowly than is usual.

Peirce is quite explicit about the way in which his postulated connections between logical and psychological or physiological categories cut across initial expectations in search of deeper similarities in kind (1931-35: 2.711):

> In point of fact, a syllogism in Barbara virtually takes place when we irritate the foot of a decapitated frog. The connection between the afferent and efferent nerve, whatever it may be, constitutes a nervous habit, a rule of action, which is the physiological analogue of the major premiss. The disturbance of the ganglionic equilibrium, owing to the irritation, is the physiological form of that which, psychologically considered, is a sensation; and, logically considered, is the occurrence of a case. The explosion through the efferent nerve is the physiological form of that which psychologically is a volition, and logically the inference of a result. When we pass from the lowest to the highest forms of innervation, the physiological equivalents escape our observation; but, psychologically, we still have, first, habit--which in its highest form is understanding, and which corresponds to the major premiss of Barbara; we have, second, feeling, or present consciousness, corresponding to the minor premiss of Barbara; and we have, third, volition, corresponding to the conclusion of the same mode of syllogism. Although these analogies, like all very broad generalizations, may seem very fanciful at first sight, yet the more the reader reflects upon them the more profoundly true I am confident they will appear.

In the case of emotion, Peirce acknowledges its manifest difference from an abductively inferred intellectual hypothesis (1868: 150 = 1931-35: 5.292):

> Now if we consider that a very complex predicate demands explanation by means of a hypothesis, that that hypothesis must be a simpler predicate substituted for that complex one; and that when we have an emotion, an hypothesis, strictly speaking, is hardly possible — the analogy of the parts played by emotion and hypothesis is very striking. There is, it is true, this difference between an emotion and an intellectual hypothesis, that we have reason to say in the case of the latter, that to whatever the simple hypothetic predicate can be applied, of that the complex predicate is true; whereas, in the case of an emotion this is a proposition for which no reason can be given, but which is determined merely by our emotional constitution.

At least from the perspective of the conscious thinker, the emotion lacks the rational connection to its manifestations which ‘an intellectual hypothesis’ has to the phenomena it explains: it is not like an equation in physics from which effects can be mathematically deduced, given initial conditions. But that difference in conscious availability is consistent with the underlying similarity which Peirce is postulating.

Peirce’s aim ‘to reduce all mental action to the formula of valid reasoning’ faces a more general challenge. For he characterizes validity as truth-preservation in all or most cases

(see above), and truth-preservation makes sense only for an argument with truth-evaluable premises and conclusion. But, on one standard use of the word 'proposition', it applies to whatever is truth-evaluable, so in that sense the premises and conclusion of a piece of reasoning are propositions. Indeed, that is what Peirce calls them in his characterization of validity (quoted above). But, in reasoning, the thinker takes some attitude, categorical or hypothetical, to the premises and conclusion. Thus Peirce's project requires all mental action to move from propositional attitudes to propositional attitudes. The prototype of such mental action is verbal reasoning, in which the thinker moves from judging the verbalized premises of a syllogism to judging its verbalized conclusion. But, in emotion, perception, and the other mental phenomena which Peirce aims to reduce to reasoning, where are all these propositions and propositional attitudes to be found? The challenge is just as pressing for abduction and induction as for deduction, since he treats all three forms of reasoning as involving the same elements, only in different orders: in the terminology of a passage quoted above, Rule, Case, and Result.

Even when explicitly discussing emotion, Peirce often uses formulations reminiscent of verbal reasoning. We have already seen him write of 'a single feeling of greater intensity, that belonging to the act of thinking the hypothetic conclusion', and claim that an emotion is 'essentially the same thing as an hypothetic inference' (1878: 482 = 1931-35: 2.643). He also describes the subject's relation to the premises as one of overtly propositional thought: 'the act of thinking that each of these predicates inheres in the subject' (ibid.), where a 'that' clause complements 'thinking'. That suggests a similarly propositional treatment of the conclusion too. Speaking of emotion, Peirce characterizes the conclusion as involving a 'simple predicate' (1868: 150 = 1931-35: 5.292). He does not specify a subject term, but a predicate calls out for one, and together they form a sentence, expressing a proposition. He compares the abductive reasoning in emotion from the complex predicate to the simple predicate to 'reasoning from definition to definitum' (ibid.), which again suggests verbal reasoning. Although he says that 'when we have an emotion, an hypothesis, strictly speaking, is hardly possible', he thereby conversationally implies that when we have an emotion, a hypothesis, loosely speaking, *is* possible.

Peirce's frequent use of the term 'predicate' in characterizing emotion suggests at the least a strong analogy between emotion and verbal phenomenon. It may be more than mere analogy. There is evidence that there are both similarities and causal connections between emotion and *inner speech* and that the two phenomena may depend on the same brain centers (Trajkovski 2019). However, that does not mean that emotion is impossible without inner speech. Granted, any process which can be represented as an abductive inference can *ipso facto* be represented as involving propositions, in the sense of truth-evaluable items, since there is no abductive inference without truth-evaluable items. However, to characterize a proposition as a truth-evaluable item is by no means to imply that it has anything like the syntactic structure of a sentence. It just needs a truth-condition. In contemporary terms, a set of possible worlds will suffice. How to express the truth-condition is quite another matter. One possibility is a sentence (in a context of utterance), but there are others.

*Sense perception* suggests an alternative, non-verbal model for propositional expression. You see a tree. You see it *as* being a certain complex, irregular, three-dimensional shape, while having no adequate verbal description of that shape in mind. The

tree may or may not really be that shape, but anyway *it looks to you as if* the tree is that shape. In that sense, you stand in a visual relation (or attitude) to the proposition that *it is that shape* (and presumably to many other propositions too). In the right circumstances, you can *see that* the tree is that shape (if the shape is sufficiently unspecific), in which case it really is that shape. Of course, much remains to be said about the subtle interrelations between object-seeing, seeing-as, and seeing-that, but the example is enough to be getting on with. It shows that one can have visual attitudes to propositions while unable to articulate them in words.

The example also provides a role for abduction, in line with Peirce's already noted view of perception as a limiting case of abduction. The three-dimensional shape you see the tree as being excludes very long branches hidden from you by its trunk or too thin for you to see. That the tree is that shape may be the conclusion of an abductive inference from visually based premises about its visible parts. Normally, no such inference is accessible to consciousness, but something of the kind may still be occurring unconsciously in your brain. Your attempts to articulate its premises in words are even more hopeless than your attempts to articulate its conclusion.

In the envisaged case of seeing, your attitude to the premises of the abductive inference is not *judgment*. The point is not just that you cannot articulate them in verbal form; you are not conscious of them at all, and so do not consciously accept them. Perhaps you are consciously entertaining the conclusion, in non-verbal form, but you need not consciously accept it—someone may have told you that it is a trick tree, with a deceptive look. But none of this excludes the possibility that you have *tacit knowledge* corresponding to the premises and conclusion of the abductive inference, in Polanyi's sense of knowing more than you can tell, for example when you recognize someone's face without being able to say how you did it (Polanyi 1966: 4-7).

Let us try to model the case of feeling one's bodily state in emotion on this account of seeing an external object's shape, in line with Peirce's abductive view of both perception and feeling. Imagine that you are angry, and feel as angry people tend to feel.

You have a feeling of your body. You feel it *as* being in a certain complex state, while having no adequate verbal description of that state in mind: perhaps the best you can do is 'My blood is boiling'. Your blood is certainly not boiling, but your body may or may not really be in the complex state S at which that half-dead metaphor gestures; anyway, *it feels to you as if* your body is in S. In that sense, you stand in a feeling relation (or attitude) to the proposition that *it is in S* (and presumably to other propositions too). In the right circumstances, you can *feel that* your body is in S (if S is sufficiently unspecific), in which case it really is in S. Of course, much remains to be said about the subtle interrelations between object-feeling, feeling-as, and feeling-that, but the example is enough to be getting on with. It shows that one can have feeling attitudes to propositions while unable to articulate them in words.

The example also provides a role for abduction. You cannot monitor all aspects of state S, we may suppose. Consequently, that your body is in S may be the conclusion of an abductive inference from prior premises. Normally, no such inference is accessible to consciousness, but something of the kind may still be occurring unconsciously in your brain. Your attempts to articulate its premises in words are even more hopeless than your attempts to articulate its conclusion.

In the envisaged case of feeling, your attitude to the premises of the abductive inference is not *judgment*. The point is not just that you cannot articulate them in verbal form; you are not conscious of them at all, and so do not consciously accept them. Perhaps you are consciously entertaining the conclusion, in non-verbal form, but you need not consciously accept it—someone may have told you that your drink was spiked with a drug which makes your bodily state feel other than it really is. Again, none of this excludes the possibility that you have tacit knowledge corresponding to the premises and conclusion of the abductive inference.

The close analogy between feeling and sense perception shows that Peirce's abductive account of feeling in emotion can avoid the danger of over-intellectualization.[6] But we can also consider another model of non-verbal propositional expression, which avoids the danger of over-intellectualization just as well and is especially apt for the *active* side of emotion, as in preparing for fight or flight—clenching one's fists in anger, or backing away in fear.

On one view of practical reasoning, the reasoner's attitude to the conclusion is *intention*, or—in the fully-fledged case—*intentional action*. For example, as Peirce will have known, Aristotle repeatedly claims that the conclusion of a practical syllogism is an action (see Corcilius 2009 for discussion). One's intention to φ is fulfilled if and only if one φs. Thus, in intending to φ, one in effect takes a practical attitude to the proposition that one φs. In intentionally φing, one takes a *factive* practical attitude to the same proposition; it entails that one does φ. Thus intentional action is the practical analogue of knowledge (Williamson 2017). For present purposes, a critical point is that the agent who intends to φ need not be able to express φ adequately in words. For instance, a skilled sword-fighter intentionally cuts, thrusts, and parries, but none of those verbs exhausts her intention. She intends to (and does) cut, thrust, and parry in highly specific ways—much of her skill consists in knowing exactly which way to select (see Stanley and Williamson 2017). She may be unable to specify those ways verbally except by demonstrating them and saying 'Like this!' The manner in which her intention specifies the proposition that she φs is irreducibly practical. Insofar as emotion is active, it may involve just such practical specifications of propositions about action. As it happens, the word 'emotion' ultimately derives from the Latin active verb 'emovere', literally *to move out*. It is still natural to speak of being *moved* by emotions—and sometimes *moved to action*. The *heat of action* typically involves emotional heat.

But is practical reasoning abductive? After all, it is deduction, not abduction, which Peirce calls 'the formula of Volition' (see above). But, in practice, reasoning about what to do is rarely deductive. The constraints on action from which one reasons rarely single out a unique action. The paradigm is Buridan's ass, paralysed between two equally good bales of hay. More often, we do not think of two options exactly tied for first place, but have to take the first good enough option we think of, without being sure that it is the best possible option—he who hesitates is lost. That may be all the sword-fighter has time for. For habitual actions, induction may do, but often more than habit is called for. A sword-fighter who fights by habit is predictable, and likely to lose against a skilled opponent. Thus abduction is the most appropriate of Peirce's three broad categories for much practical reasoning. Seeing how to solve a practical problem can be quite similar to seeing how to solve a theoretical problem. Both often involve the novelty, the new idea, which Peirce insists is characteristic of

abduction. Both practical and perceptual ways of relating to propositions cast light on emotion.[7]

## 4. *Damasio*

The neuroscientist Antonio Damasio is often described as having revived James' theory of emotion. He has indeed gone some way towards vindicating James' insights into the importance of bodily states in emotion. However, we will argue, Damasio's experimentally based account is actually closer to Peirce's than to James'. In particular, something similar to Peirce's abductive conception is present in Damasio too, but (as already noted) absent from James. Before explaining the similarity, it will be useful to discuss a way in which Damasio's view differs from—and arguably improves on—Peirce's as well as James'.

As we have seen, both James and Peirce tie emotion very closely to feeling: they take for granted that the former cannot be without the latter. This prevents them from doing justice to the subtle common sense distinction already explained between *being* angry, sorry, or frightened and *feeling* angry, sorry, or frightened, and likewise for all other emotions. The complaint is not about the obvious, unproblematic fact that James and Peirce were not ordinary language philosophers in either aims or methods. Rather, the point is that there is a genuine, projectible, explanatory distinction, which can be articulated in natural language, between having an emotion and feeling the emotion. For example, someone may have problems in later life because he is still angry with his mother, but does not feel angry with her. A fully adequate theory of emotion must make sense of the difference.

In contrast to James and Peirce, Damasio distinguishes sharply between emotion and feeling. Most dramatically, he writes: 'Emotion and related reactions are aligned with the body, feelings with the mind' (2003: 7). But he does not intend some metaphysical dualism, which James and Peirce would have rejected. He is simply distinguishing what is internal to the mind from what is external to the mind, on some appropriate cashing-out of the internal-external metaphor, without prejudice to any ontological dependence of mind on mind. In discussing Walter Cannon's critique (1927) of the James-Lange theory of emotion, Damasio writes 'Cannon's argument is an example of the confusions that result from not distinguishing that which is external [to the mind], such as an emotion, from that which is internal, such as a feeling' (1999: 193).

Damasio's claim is that 'Feelings are perceptions' and 'A feeling of emotion is an idea of the body when it is perturbed by the emoting process' (2003: 85, 88). In calling the feeling an 'idea', he emphasizes the intellectual sophistication of feeling with respect to emotion. On his view, to *be* angry is to be in a certain kind of bodily state, and to *feel* angry is to perceive oneself, by the modality of feeling, as being in a state of that kind. In short, the feeling is not the emotion itself but a perception of it. Damasio's neuroscience vindicates something very like the common sense distinction. Of course, a fuller account than Damasio's will have to reconnect the emotion with what it is *about*, and so will have to go beyond the bodily states he has in mind, but we put that problem of intentionality aside in section 1. There is no reason why solving it should undermine the treatment of feelings as perceptions of emotions.

By itself, Damasio's separation of emotion from feeling may not involve a radical restructuring of either James' theory or Peirce's. Perhaps it can be achieved by retaining the overall structure while assigning a smaller part of that structure to the category of emotion. A greater difference comes from Damasio's account of *how* emotion is perceived in feeling.

According to Damasio, 'the essential content of feelings in the mapping of a particular body state; the substrate of feelings is the set of neural patterns that map the body state and from which a mental image of the body state can emerge' (see Catani 2017 for a recent discussion of these brain maps of the body). Damasio observes: 'the mapping of the body that constitutes the critical part of this hypothesis is unlikely to be as direct as William James once imagined' (2003: 88). The less direct process for which Damasio argues has an abductive structure, more like the one Peirce postulated, although this connection seems not to have been noticed in the literature.

On Damasio's account, body-sensing is a process by which dynamic neural maps in the brain represent states of the body. Some of those states constitute emotions. As a result, the neural maps can represent emotional states. But being in a certain emotional state still does not guarantee that this state is felt as a corresponding emotion. Such feelings 'emerge when the sheer accumulation of mapped details reaches a certain stage' (2003: 86). For example, various properties E1, E2, E3, E4, … of a bodily state are associated with an emotion, say fear. E1, E2, E3, E4, … are *sensed*, rather than felt, and represented in a body map. But when the sensed properties reach a critical mass, they trigger the recognition of the pattern associated with the emotion E, fear. Only when E1, E2, E3, E4, … are united under E is fear *felt*. In Damasio's words (2003: 110):

> [the] nervous system must be able to map body structures and body states and transform the neural patterns in those maps into mental patterns or images. Without the latter step, the nervous system would map the body changes that are the substrate of feelings without quite getting to the point of producing the idea that we call feeling.

Again (ibid.: 87):

> As I see it, the *origin* of the perceptions that constitute the essence of feeling is clear: There is a general object, the body, and there are many parts to that object that are continuously mapped in a number of brain structures. The *contents* of those perceptions also are clear: varied body states portrayed by the body-representing maps along a range of possibilities. For example, the micro- and macrostructure of tensed muscles are a different content than relaxed muscles.

For Damasio, 'perhaps the most important' example is 'the composition of the blood relative to some chemical molecules on which our life depends, and whose concentration is represented, moment by moment, in specific brain regions' (ibid.). Many such bodily states are not felt consciously one by one, but only 'in "composite" form' (ibid.: 88). In the case of fear, some of the bodily properties E1, E2, E3, E4, … are themselves not only sensed by the

body map but felt by the subject. To cite a more recent account, such 'fear feelings are physiological responses, and are often clear and localizable: these include a tightness in the throat, tension in the chest, dry mouth, sweating, gastrointestinal sensations, and heart pounding' (Garfinkel and Crichley 2014: 112). But not all of E1, E2, E3, E4, … need be like that: 'The pattern of autonomic bodily response elicited by fear induction is characterized by heightened sympathetic activation, reflected in increased heart rate, myocardial contractility, peripheral vasoconstriction, and increased electrodermal activity [....], and systemic vascular resistance is often reduced. Parasympathetic vagal influences on the heart are also usually diminished, decreasing heart-rate variability.' Sometimes 'bradycardia appears as a dominant and amplified early orienting response that enhances cardiac filling for the next heartbeat." If sudden the initial bradycardia is "frequently accompanied by motoric freezing. ... Fear states are also accompanied by increased respiratory rate...Fear also elicits humoral (adrenal) stress responses into the bloodstream' (ibid., 112-113).

In Peirce's terms, the process of grouping E1, E2, E3, E4, … together into a whole is called 'colligation'. The transition from E1, E2, E3, E4, … to E corresponds to Peirce's account of abduction (hypothesis), which 'substitutes, for a complicated tangle of predicates attached to one subject, a single conception'—the new idea. In effect, there is an abductive inference from E1, E2, E3, E4, … to E, whose upshot is that one feels afraid.

Since it takes time for the fear which the bodily states jointly constitute to be felt, one *is* afraid before one *feels* afraid. Since the process may be interrupted, one may be afraid without even subsequently feeling afraid. Conversely, one may *feel* afraid without *being* or even *having been* afraid. For body maps can misrepresent bodily states as well as represent them correctly (Damasio 2003: 112-130), just as one can misperceive the external environment as well as perceive it correctly. To feel afraid is to feel oneself *as* afraid, which one can do without being afraid. Not every abduction has a true conclusion. Natural language uses other locutions to distinguish veridical perception of emotion. For example, one can *feel one's anger* only if one *is* angry, and one can *feel one's anger rising* only if one's anger *is* rising, just as one can *see the paper's wetness* only if the paper *is* wet, and one can *see the wetness spreading* only if the wetness *is* spreading.

As already indicated, Damasio-style abductive reasoning is generally not a fully conscious process, since many of its premises are not accessible to consciousness. It might therefore be regarded as reasoning only in an aetiolated sense. That would not be Peirce's attitude, since he holds that 'a syllogism in Barbara virtually takes place when we irritate the foot of a decapitated frog' (see above). But even if our conception of reasoning is less inclusive than Peirce's, we should still acknowledge the explanatory power of analogical uses of the category, applied to broadly cognitive phenomena—just as, even if body maps are not literally *maps*, the analogy makes their function much easier to understand. Similarly, we can take scientists' hypothesizing as the prototype of abduction and still use the category to understand the unconscious processes involved in feeling an emotion.

Such an account has consequences for the epistemology of feeling. For example, is *feeling afraid* based on evidence? In one sense it is, because it can be represented as an abductive inference from numerous premises. But few, if any, of those premises are available to consciousness. By normal standards, if one is the thinker, they are no part of one's evidence. Nevertheless, their status is epistemologically relevant. If they are false, one does

not *feel one's fear*; even if one knows that one *feels* afraid, one may not know that one *is* afraid.

One may also *feel as if afraid* while knowing that one is *not* afraid. Such cases have been reported in practice. For example, Walter Cannon describes the work of the physiologist Gregorio Marañón (1927: 113):

> In a careful study of the effects of adrenalin on a large number of normal and abnormal persons Marañon has reported that the subjective experiences included sensations of precardial or epigastric palpitation, of diffuse arterial throbbing, of oppression in the chest and tightness in the throat, of trembling, of chilliness, of dryness of the mouth, of nervousness, malaise and weakness. Associated with these sensations there was *in certain cases* an indefinite affective state coldly appreciated, and without real emotion. The subjects remarked, "I feel as if afraid," "as if awaiting a great joy," "as if moved," "as if I were going to weep without knowing why," "as if I had a great fright yet am calm," "as if they are about to do something to me."

Here subjects' knowledge that they lack an appropriate intentional content may contribute to their knowledge that they lack the emotion—an aspect of emotion put aside at the start of this article. They may also be making a distinction between *feeling afraid* and the more qualified *feeling as if afraid*.

Of course, to be fully adequate, Damasio's account of emotions would have to be integrated with an account of their objects, or contents. We have not tried to meet that challenge here.

In brief, the epistemology of feeling emotion is a much richer topic than one might have suspected. We commend it to the reader.[8]

Notes

1 The boy survived to tell the tale. He could see from his bodily reaction that he must be afraid, but that does not imply that he *felt* afraid. Feeling is a different modality from seeing. Feeling anxiety and fear is a specific process involving the vagus nerve, as James knew; for a modern discussion see George et al. (2008), especially at 120. He writes of the pneumogastric nerve (James 1890: 35, 257, 323); that is the older name for the vagus nerve (Vilensky et al. 2015: 190).

2 A closely related dissociation phenomenon applies even to pain: perhaps surprisingly, there are states best understood as cases of being in pain without feeling pain, and other states best understood as cases of feeling pain without being in pain; the sensation and the suffering are not coextensive. See Grahek 2007 for discussion.

3 Peirce has a broad category of action which includes all the items in the list, and also thought and inference.

4 This is related to his inclusive category of action, as in n. 3.

5 From a Peircean perspective, the underlying abduction may be what justifies the induction to ‘All emeralds are green’, and differentiates it from the bad induction to ‘All emeralds are grue’. See Misak 2004 and 2013 for discussion.

6 The close cognitive analogy is consistent with the cognitive disanalogies identified in Dietz 2018.

7 For more on the connections Peirce drew between abduction and action see Misak 2004 and 2013.

8 This paper is partly based on a paper by the first author entitled ‘Abduction, perception and emotion – pattern recognition of body maps’, which she presented at the workshop 'Explanation and abduction: Logico-philosophical perspectives’ at Ghent University in 2015. We thank Cheryl Misak and Christina Dietz for helpful comments on an earlier version of the paper.

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