

An Unexpected Pleasure

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As topics in the philosophy of emotion, pleasure and displeasure get less than their fair share of attention. On the one hand, there is the fact that pleasure and displeasure are given no role at all in many theories of the emotions, and secondary roles in many others.¹ On the other, there is the centrality of pleasure and displeasure to being *emotional*. A woman who tears up because of a blustery wind, while an ill-advised burrito weighs heavily upon her digestive tract, feels an impressive number of the sensations felt by someone who is gut-wrenchingly sad. Yet, unless she feels *bad*, the way she feels is only a pale echo of the feeling of sadness. If she feels good in spite of the burrito and the wind, then she does not feel at all the way she would if she were sad. Likewise, a man falling asleep can hardly fail to feel his muscles relax, his heart rate fall, and so on, but unless he feels *good* his state is only a shadow of feeling content.

This paper will begin with a sketch of the nature of pleasure and displeasure, and the relation between them and the feelings that are characteristic of emotions. It will then argue that the capacity to feel pleased and displeased is, quite literally, a sense modality: one allowing us to perceive net change in the satisfaction of our intrinsic desires. As with any sense modality, the capacity to feel pleased and displeased displays substantial modularity. The paper concludes by considering the ways in which the modularity of pleasure and displeasure contributes to effects that might reasonably be called “the modularity of the emotions.”

1 Quite a few books on emotions neglect pleasure and displeasure, for example, Green (1992); Griffiths (1997); and Goldie (2000), though there are exceptions (Prinz 2004).

I. Groundwork

From Plato through to John Stuart Mill or so, philosophers had a reasonably clear idea of the nature of pleasure and displeasure (jointly: hedonic tone). Hedonic tone, they held, is a distinctive state of consciousness, not unlike feelings of warmth and coldness.

In the twentieth century, this orthodoxy was frequently, if puzzlingly, rejected by a number of philosophers. Bertrand Russell and Gilbert Ryle argue that pleasure is merely a style of behaviour (Russell 1921; Ryle 1949; 1954). Michael Tye holds a very similar view (Tye 1995). Jesse Prinz joins neuroscientist Tony Damasio in the view that hedonic tone is a matter of a whole-body “landscape” of felt changes in breathing, heart rate, piloerection, and the like, rather than a distinct kind of feeling (Damasio 1994; Prinz 2004). And Elijah Millgram goes so far as to argue that pleasure is “the rock-bottom judgment of desirability of an object of present experience” (Millgram 1997).

I side with the older orthodoxy. Hedonic tone is a distinct type of feeling, not a judgment, not a composite feeling built out of the feelings of one’s viscera, not a style of behaviour. The argument for this will be brief. (I refer those who are unconvinced to work published elsewhere.²)

First, the phenomenology of intense pleasure and displeasure should be a sufficient refutation of the view that hedonic tone is a style of behaviour. There is something it is like to be elated off and on for the whole next day after one’s first kiss, and something it is like to be profoundly saddened by the death of a parent, and a reduction of these feelings to behavioural styles is not credible. This would also seem sufficient evidence to answer Millgram, unless Millgram is willing to identify rock-bottom judgments of desirability with the distinctive phenomenology of pleasure.

The whole-body landscape view of hedonic tone survives this particular challenge. In elation and sorrow, one *does* experience global changes in one’s viscera, musculature, and the like. The main challenge to the whole-body landscape view is that it fails to account for the grouping together of instances of pleasure under that heading, and likewise for the unity of instances of displeasure. What do pro-

2 See Schroeder (2004), 71–106; Aydede (2000).

found, lazy contentment and energized ecstasy have in common? At least this much: both are states of great pleasure. But what sort of felt bodily landscape do they share in common? Not the feelings of the viscera (heart beating lazily in the one, wildly in the other; breathing slower in one, faster in the other), not the feelings of muscle contraction and relaxation, not feelings of piloerection (ecstasy-causing news can make one's hairs stand on end, but contentment does not), not felt facial expression (compare the facial expressions induced by ecstatic sex and lazing in the sun). Perhaps a careful study would find certain bodily landscapes common to these two kinds of pleasure, but what is left after these differences are factored out will not be a reasonable candidate for the feeling of pleasure. One might object that profound contentment and ecstasy are really different feelings, and so should not be expected to share a bodily landscape, but the point is that, although the feelings are different, they are also alike in that both involve great pleasure, and it is this kinship that still needs explaining. Relatedly, one might ask how "feeling good" and "feeling bad" are terms easily learned by children, whereas the various species of these genres are learned more slowly, if there is not some introspectable common quality shared by every way of feeling good, one that feels the opposite of every way of feeling bad.³

This could become a much larger discussion, but enough has been said for present purposes. This paper will proceed on the assumption that pleasure and displeasure are distinctive feelings.

What is the relation of these feelings to the emotions? The answer gestured at in the introduction is that every felt emotion involves some measure of pleasure or displeasure. A few distinctions will help make this clear. If a distinction is made between emotional states (being afraid of dogs, hoping that global warming is reversible), which generally persist over a long time, and emotional episodes (suddenly fearing a particular dog, or being filled with hope that global warm-

3 Jesse Prinz leaves open the possibility that what is felt is actually changes in one's neuromodulators – in dopamine or in endorphin, perhaps (Prinz 2004). This is harder to rule out, but also closer to the view I wish to endorse, since I suspect that the only feeling endorphin causes in people is pleasure itself: there is no distinctive feeling to endorphin that survives the above challenge, at any rate.

ing is reversible), which are generally short-lived, then emotional episodes are the ones on which this paper is focussed. One can be afraid of dogs even while profoundly unconscious, in the emotional state sense, but one cannot be *fearful*, in the emotional episode sense, and likewise one cannot be pleased or displeased either. The claim is that every emotional episode involves some non-zero degree of pleasure or displeasure.

“Involves” is deliberately vague. Perhaps some very cognitive theory of the emotions is correct. Then an emotional episode is an ontologically derivative event, involving feelings that are in no way ontologically necessary to the existence of the emotion in question. Or perhaps some Jamesian theory of the emotions is correct, and feelings are involved in emotions in that they are the ontological ground for the existence of the emotion. Or perhaps some hybrid theory is right, and feelings are part but not all of what makes something an emotion. There is no need to settle these issues here. The claim is that, whatever emotional episodes are, they always involve pleasure or displeasure.

The argument for this modest claim is straightforward: simply repeat the familiar Jamesian subtractive thought-experiment with pleasure and displeasure in the place of visceral feeling, and consider the result. In James’s original thought experiment, we are asked to consider an emotional episode stripped of the feeling of a pounding heart, laboured breathing, knotted stomach, and so on, until all bodily feelings are eliminated (James 1890). What, James asks, is left of the emotional event? His answer, famously, is that nothing is left. To perform my version of the Jamesian thought-experiment, keep all of these visceral feelings, but subtract out all pleasure and displeasure, and ask what is left of the emotional event. The emotional event has been stripped of its core. Fear without displeasure is neutral arousal, a prickling sensation on one’s arms, dampness on one’s skin – a condition that, if observed with “scientific detachment,” “dispassionately” (i.e., without pleasure or displeasure), is no more emotional than any other randomly selected conjunction of visceral states.

The above argument presupposes that pleasure and displeasure are something over and above felt bodily landscapes, and so will hardly convince everyone. A more broadly acceptable argument, making no particular assumption about the nature of pleasure, asks the reader to consider surprise. Normally, surprise is taken to be an emotion, pos-

sibly even a core basic emotion (Ekman 1972). But consider a person for whom life is a sequence of hedonically neutral surprises. The surprises are neither good nor bad, neither delightful nor shocking. They are simply sudden, visceral recognitions of the unexpected, perhaps accompanied, in the style of Mr. Spock, with a slight arching of one eyebrow. The life of such a person is, if anything, emotionally dull. It is certainly not a life full of intense emotion. Yet a person who battled depression – regularly slipping into sorrow, then finding calm, only to be dragged into sorrow again – would clearly be leading an emotionally charged life, as would a person who was often joyful, or often angry, or often fearful. So, too, would a person who was regularly shocked or delighted – i.e., subjected to a combination of displeasure and surprise, or pleasure and surprise. If having an emotionally charged life is having a life full of emotional episodes, then these considerations suggest that surprise that is not mixed with pleasure or displeasure cannot constitute an emotional episode, and that putative emotional episodes in general require pleasure or displeasure (whatever their nature) in order to count as truly emotional.

II. A Theory of Hedonic Tone

It is time to investigate hedonic tone in more detail.⁴ Consider a few of the central facts about pleasure and displeasure.

1. They are opposites that come on a continuum with a neutral mid-point.

Although this much is straightforward, it leaves a few details unspecified. Perhaps there are upper and lower bounds to the continuum, or perhaps it simply becomes more and more difficult to ascend higher (or fall lower) on the continuum the further one goes along it. Nothing hangs on these details for present purposes, however.

2. They are not normally felt simultaneously, though they can be.

⁴ Similar ground is covered in my work elsewhere (Schroeder 2004, 71–106).

Normally pleasure cancels out antecedent displeasure, and vice versa, or at least ameliorates it. Cases of simultaneous pleasure and displeasure include the overwrought laughing/crying feeling one can have when suddenly relieved of some great stress, or the bittersweet feeling one can get from the needed yet regretted end of a romantic relationship.

3. They tend to be triggered by external events regarding which we have some desire.

Montreal's winning the Stanley Cup would cause pleasure in those who want Montreal to win the cup, displeasure in those wanting them to lose, and nothing in those not desiring one way or the other, for example. Likewise for the pleasures of the table, etc.: it is only when one desires water that one is caused pleasure by drinking it.⁵

4. They tend to be influenced by antecedent expectations.

If Theresa is accustomed to sleeping on a nice double bed, being forced to sleep on a plastic-coated single bed (say, in a student dorm) will be unpleasant; but if she lives in the dorm, she will become accustomed to the less-nice bed, and stop being caused displeasure by it. Similarly, if she is sure that Montreal will win the Stanley Cup, she will be more displeased by a loss than if that was what she was expecting all along, all else being equal.

5. They provide information about desires.

5 Two issues. First, one need only have a desire for something that one takes to be achieved by drinking water in order to be pleased by it, normally. There is no need to desire to drink a glass of water in order to be pleased by drinking one if one also desires to get to the bottom of the glass (say). This wrinkle is important but not particularly important for what follows. Second, one might wonder if the link between pleasure and desire really exists in cases such as getting pleasure from the smell of baking bread. Do people who get such pleasure get it *because* they desire to smell that smell (or any smell from a family that includes it)? In earlier work (Schroeder 2004), an extended argument is made that the answer is "yes," but the issue will be deferred here.

When a person is not sure what she wants, one simple strategy is to consider the possibilities as vividly as possible, and then note the resulting pleasure or displeasure that comes as one considers each. Whatever possibility evokes the most pleasure is likely to be the possibility one most desires.

6. They can be defective in some sense, when not triggered in the usual ways.

A person who drunkenly does something foolish may enjoy it at the time, only to bemoan the act in retrospect. Sober friends observing the drunken act are likely to speak of “clouded” judgment, remark on the “inappropriate” hilarity, and note that “he’s not seeing things clearly right now.” Similar remarks apply to those whose hedonic states are strongly influenced by mood disorders, major life events that infect every aspect of life (falling in love, losing a loved one), and so on.

7. They are associated in some way with goodness and badness.

When I was little, I first learned to talk about pleasure and displeasure through the locutions “feeling good” and “feeling bad,” and of course many have thought that there is something inherently good in pleasure and bad in displeasure.

One would hope that a theory of hedonic tone would explain most of these facts, if not all of them. But consider what explanatory resources are available to standard theories of pleasure and displeasure.

A type-identity theory of hedonic tone identifies it with some particular state of the brain: activation in a region of perigenual anterior cingulate cortex, as it might be (Schroeder 2004, 76–83). Such a theory has no resources whatsoever for explaining why pleasure is the opposite of displeasure, since biologically the two states are (it seems) realized in adjacent, mutually inhibitory cortex, not “opposite” kinds of cortex, whatever that would be. There might be hope for explaining some of the other phenomena in causal/biological terms, but the “defectiveness” of some kinds of pleasure caused when there is no biological defect in a person is harder for an identity theorist to

explain, and certainly the link to goodness and badness must be left a mystery.

A standard causal-role functionalist theory of hedonic tone identifies it with any state playing a certain role, such that it has two subdivisions (at least) that play off against one another, have their effects on a continuum, are not typically felt simultaneously, carry information about desires, tend to be influenced by expectations, etc. But by so identifying it, a standard causal-role functionalist theory leaves no room for explanation. Just as one can hardly explain why the glass broke by saying it was breakable, so one can hardly explain why pleasure and displeasure play off against one another by saying that they are any two states such that, among other things, they play off against one another. To be this sort of functionalist about hedonic tone is to give up explaining the core phenomenon (explaining them in psychological terms, at least) in favour of treating them as constitutive. "Pleasure is like that because, if it weren't, it wouldn't be pleasure" is about the best this sort of functionalism can do.

It would be nice to do better. Consider treating pleasure and displeasure as sense modalities that allow us to sense the thing that they tend to be triggered by: changes in desire satisfaction. Treating them in this way promises to provide an impressive array of genuine explanations for the phenomena in question.

First, desire satisfaction is the opposite of desire frustration, hence their representations will have opposite contents. Desire satisfaction and frustration also come on a continuum: on balance, one's desires can be more frustrated or less, depending on how many desires were just satisfied or frustrated, and how much one desired each thing. This continuum has a natural zero-point, at which desire satisfaction balances desire frustration (either by there being none of either, or by their cancelling out), just as hedonic tone does.

Second, desires are never, on balance, more satisfied *and* more frustrated, so any system representing them should not, as a matter of course, represent them as both. But any representational system can misrepresent.

Third, that pleasure and displeasure are triggered by desire-satisfying events is no surprise if desires represent change in desire satisfaction.

Fourth, the relation between hedonic tone and antecedent expectations makes sense if what desires represent is change in desire satisfaction, since change must be change relative to *something*.⁶

Fifth, hedonic tone is a natural source of information regarding one's desires if it is itself a sensory representation of changes in those desires' satisfaction.

Sixth, since any representation can misrepresent, there is nothing odd about the notion of error in one's hedonic tone.

Seventh, insofar as one accepts that what is good for an organism is defined by what the organism intrinsically desires, a measure of change in desire satisfaction is also a measure of whether things are going *better* or *worse*, so far as the organism is concerned.⁷

Treating hedonic tone as a sense modality, one representing change in desire satisfaction relative to expectations, is thus a more fruitful explanatory framework than other standard frameworks in the philosophy of mind. It is also a framework with implications for the modularity of the emotions.

III. The Modularity of Pleasure

It is a familiar idea about the sense modalities that they display some set of the various features of modules (Fodor 1983). That is, they tend to be domain-specific, to produce their output whether or not the organism desires it, to operate quickly, to be informationally sealed off from the rest of one's knowledge, to be subject to illusion, and so on. These features are readily seen to apply to hedonic tone. Hedonic tone is clearly domain-specific (it is designed for a limited, special purpose), it is obviously independent of a person's desires (as anyone who has ever suffered unwanted feelings knows), and it oper-

6 It should be admitted that there is nothing in representing desire satisfaction that requires that change relative to a baseline be represented, as opposed to raw current total of satisfaction (say), and so this fourth feature of hedonic tone is not really given a robust explanation by the current theory. But notice that some sense modalities focus at least as much on change from baseline as they do on absolute value. Compare hedonic tone to one's sense of warmth and cold, for instance.

7 As this is not a work of moral philosophy, I will leave it at this.

ates quickly (there is typically no perceptible time lag between being aware of some new fact and feeling its hedonic effect). If phenomenon (6) is to be trusted, then hedonic tone is also subject to illusions, another hallmark of modular systems. And phenomenon (6) *should* be trusted. Many people with mood disorders are quite capable of knowing, at some highly intellectual level, that things are not so bad, that their work is good, that they are loved, and so on, while also *feeling* that things are terrible, that their work is abysmal, and that they are not loved. These known-to-be-false feelings are best understood as hedonic illusions: a depressive disorder is a condition in which one's hedonic tone tells one that things are worse (that one's desires are worse satisfied) with respect to whatever part of one's life one considers, whether or not this is the case.

Most interesting for this paper is the idea that hedonic tone is, or is not, informationally encapsulated. On the one hand, it is clearly false. When Theresa is told that Montreal won the 2005 Stanley Cup, she does not feel pleasure, because she knows perfectly well that the NHL season was cancelled that year, and this high-level cognitive information blocks the power of the phrase "Montreal won the 2005 Stanley Cup" to induce pleasure in her. On the other hand, there is *something* to the idea of informational encapsulation. As an illustration, think of two people playing roulette, both of whom bet a small amount of money on black, both of whom win. Both have full knowledge of the objective probability of winning (17/36), which is transparent from the structure of the game. At the level of conscious deliberation, both agree about how likely the win was, but even so one may accept the win practically as a matter of course, being supremely confident in her luck, while the other may be quite surprised, having expected herself "at some level" to have bad luck. These differing expectations are not differences at the straightforward level of belief, and in fact appear to be insulated against the influence of conscious beliefs in a way that is characteristic of modular systems. Call these sorts of expectations "gut-level" expectations. Statements such as "Of course I knew she would be late, but somehow it still surprised me" are expressions of the effects of such gut-level expectations. The same sort of phenomenon is found in parents feeling sure that a missing child is alive even while accepting the rationality of holding that there is a great risk that the child is dead, and in people who "can't quite believe" they got the

great new job, romantic partner, or piece of financial luck they did. Generally, one's gut-level confidence in a given proposition matches one's consciously held level of confidence, but the fact that these are separate cognitive states is shown by the ease with which they come apart under various conditions.

When considering cases, I think the reader will find that pleasure and displeasure tend to vary with confidence and resignation when the confidence and resignation are felt in the "gut" or "heart." Reasoned estimates of likelihood believed with one's "head" sometimes correspond to what is felt in one's gut or heart, but when the two come apart, tendencies to pleasure or displeasure follow the viscera.

To explain the way in which hedonic tone might be informationally encapsulated in some manner, while informationally open in some other, consider again what it means for hedonic tone to be a sense modality.

For most of the senses, input to sensory representations (in cortex) comes directly from non-representational (at least, non-psychological) structures: the eyes and optic nerve, ears and auditory nerve, and so on. So there is no opportunity for non-encapsulated cognition to play any role in the input side of sensory processing. However, there is no *need* for things to be this way in a sense modality. To calculate change in desire satisfaction, a sensory system needs information about what is happening in the world, and there is no reason inherent in being a sensory system that requires this information to come directly from transducers. And, in fact, there is no obvious way to directly transduce information about, say, whether or not Montreal has won the Stanley Cup. If this information is relevant to change in desire satisfaction, then any sense modality purveying information about such changes must get the information, not from transducers, but from sophisticated cognitive systems. So it is in organisms like ourselves. We feel pleasure or displeasure in a way that depends very much on how we cognize the world to be, using our fullest intellectual resources. In this way, hedonic tone is not informationally encapsulated.

Information about what obtains in the world is not the only input used to produce hedonic tone, however. Since hedonic tone represents change in desire satisfaction, three sorts of information are required: what obtains in the world, what was expected, and what is desired. The phenomenon of gut-level expectations suggests that informa-

tion about what is expected to be the case is calculated in at least two ways, one that is informationally open and one that is informationally encapsulated. Even though two people know the objective probabilities in a game of chance, and so “at one level” expect the same thing, this knowledge need not influence their subjectively felt expectations; even though a woman knows “rationally” that while shopping for groceries her father is going to express surprise, yet again, at the high price of milk these days, she may still be capable of being astonished herself that he remains endlessly surprised; and so on. Furthermore, it appears that it is the encapsulated, special-purpose, gut-level calculation that is used to calculate hedonic tone. The two people with different gut-level expectations of winning at roulette will, all else being equal, take a win or a loss differently: the person expecting the win will enjoy a win, of course (unless playing with such supreme confidence that to win now is just boring), but the person not expecting it will be correspondingly more delighted to be proven wrong, all else being equal. Likewise, the person who has ceased to be surprised by her father’s foibles is also the person who, all else being equal, is less exasperated by them.

There are complications in real cases. For instance, people with low confidence in the occurrence of good things are often people who are hurt worst by bad news, while people with high confidence in the occurrence of good things are often people who are most resilient to bad news. But this is because such people tend to be different in a large number of ways. People who tend to have low confidence that good things will happen to them are also people who tend to see each negative event as evidence that they are, more than ever, doomed to unhappiness, or as evidence that other bad things will soon happen, while people who tend to be confident that the future bodes well for them do not place such interpretations upon bad news. Naturally, this makes a difference to hedonic tone, but not one which conflicts with the present theory of hedonic tone. Likewise, people who have low confidence in the occurrence of good things often tend to depression, and depression is a condition in which one’s hedonic tone is largely unresponsive to one’s actual circumstances – a condition of systematic misrepresentation, in other words, akin to numbness in the skin or tinnitus. People who systematically misrepresent deviation from expected desire satisfaction, naturally enough, are not going to have

displeasure which is readily predicted by the present theory. A certain amount of caution is therefore required in comparing everyday cases, looking for the effects of gut-level confidence and resignation. But when this caution is employed, the present theory fits the evidence of common sense well.

There is biological evidence for both of the most important claims just made: that there are two distinct systems, one encapsulated, one not, for forming expectations, and that it is the encapsulated system that contributes to feelings of pleasure and displeasure.

In a series of ground-breaking studies, Wolfram Schultz and colleagues have convincingly shown that the release of dopamine by key midbrain structures carries information about the difference between actual and expected reward (see, e.g., Romo and Schultz 1990; Schultz and Romo 1990; Schultz et al. 2000). Input to these dopamine-releasing structures comes, in the first instance, from sub-cortical structures thought to be involved in forming expectations about reward. The nucleus accumbens apparently features prominently here, perhaps along with parts of the caudate nucleus (Knutson et al. 2001; Pagnoni et al. 2002; Berns et al. 2001). These sub-cortical structures take input from cortical structures, but perform their own operations upon this input. As I argue elsewhere, information about the difference between expected and actual reward amounts to information about change in desire satisfaction (Schroeder 2004). Since output from midbrain dopamine-releasing structures appears to be an extremely important causal contribution to pleasure – their activity seems to be responsible for the pleasure induced by cocaine (Gawin 1991), ecstasy (Liechti and Vollenweider 2000), and other pleasure-causing drugs (Kandel et al. 2000) – the case that this pathway for determining reward-related expectations drives hedonic tone seems reasonably secure. But head- (as opposed to gut-) level expectations are the sorts of things one expects to be produced in cortex, especially in those regions of cortex involved in conscious reasoning, and stored in explicit memory. In short, one expects such expectations to be created in structures quite different from the sub-cortical structures connected to dopamine signalling. Hence there are two different routes to expectations, only one of which has a distinguished connection to pleasure.

IV. The Modularity of the Emotions

Having described a respect in which hedonic tone is modular, and having linked hedonic tone to emotional feelings, what is left is to draw the conclusions for the modularity of the emotions.

Talk of the modularity of the emotions brings to mind a number of phenomena. Without making an attempt to systematically survey them all, candidate phenomena include:

1. The cognitive impenetrability of phobias.
2. The power of fictions to excite episodic sadness.
3. The capacity people have to be shocked by what we knew would happen.
4. The tendency of anger to linger even after it has been undercut by new information.
5. The difficulty of ridding oneself of dispositions to episodic guilt and shame learned in childhood.
6. The power of fear to prime flight.
7. The fact that emotional feelings are organized into coherent clusters.
8. The fact that many emotional feelings are coordinated by evolutionarily old structures in the hypothalamus and amygdala.

For most of these phenomena (4–8), it is clear that understanding the modularity of hedonic tone contributes little or nothing to their own understanding. But we can gain insight into a few.

Consider the cognitive impenetrability of phobias. This might seem to be a prime example of the modularity of hedonic tone explaining something about the modularity of an emotional episode. When Justin is fearful of Alpha Helix, a manifestly harmless dog, that episodic fear involves a feeling of displeasure. Might it not be the case that the dysfunction, in a phobia, is in part a dysfunction in the gut-level calculation of expectations? This seems a reasonable speculation. If Justin's gut-level expectation of being bitten is much too high, then the dog will make him feel displeasure, which he certainly does. This sounds like the beginning of a promising inference to the best explanation.

Unfortunately, there are substantial complications. Research both conducted and reviewed by Joseph LeDoux (see, e.g., LeDoux 1996)

strongly suggests that phobias are created by Pavlovian-style conditioning of the amygdala, a structure quite distinct from those involved in producing the midbrain dopamine signal, or from those instantiating hedonic tone. The amygdala mediates unlearned associations between stimuli and characteristically emotional bodily responses, and can learn to associate new stimuli with existing responses. And although the connections are not clear, it seems that one of the pathways leading out of the amygdala reaches the brain's centre of hedonic tone, exerting influence over it just as it influences heart rate or the activity of the gut. So it may be that the dysfunction in a phobia is located entirely in the amygdala and its too-strong association between certain stimuli (e.g., dogs) and characteristic fear responses, and that the displeasure that makes up part of the felt episodic fear is simply a causal consequence of dysfunction elsewhere. Even if hedonic tone were cognitively penetrable, it could well be that cognitive penetration wouldn't guarantee an absence of displeasure in the case of Justin facing Alpha Helix, given the causal action of the amygdala.

Likewise, insofar as other emotions such as sadness draw upon the amygdala for their production, they too will have their cognitive impenetrability best explained through appeal to the cognitive impenetrability of the operation of the amygdala, and not through appeal to the distinctive impenetrability of hedonic tone.

However, as one turns to somewhat different emotions, the significance of the informational encapsulation of hedonic tone increases. Consider the feelings of shock and delight, feelings that are predominantly made up of surprise and negative or positive (respectively) hedonic tone. These are phenomena that seem more promising candidates for explanation in terms of the hedonic system's modularity. Examples given above seem to suggest that the pleasure and displeasure involved in such feelings is strongly influenced by gut-level expectations, at least in many cases. (We might discount the shock of seeing a dog in the house when one is a dog-phobe, for instance, in light of the previous discussion.) One can know that one's hero has called a press conference to confess to misbehaviour, or to announce retirement, and yet still "at some level" not believe it will happen, and so feel a shock as the fateful words are pronounced. Likewise, it takes a certain length of time in a romantic relationship for one to cease to be delighted by the charming quirks of one's beloved, even once

one has come to be intimately familiar with them at a cognitive level. (Eventually, of course, the actual episodic delight wears off. One's gut-level expectations clearly *do* learn, just less quickly in many cases than one's intellectual expectations.)

Hope and dread seem likewise very much influenced by gut-level expectations, and so present further cases in which the modularity of pleasure infects emotional episodes. It is easy to find oneself hoping for what one is intellectually convinced is a lost cause, dreading what one knows is quite unlikely, and so on.

These cases give us a puzzle, though. If dread is really a species of fear, then shouldn't its modularity be driven by the amygdala, and not by hedonic processing after all?

This is a deeper puzzle than contemporary neuroscience and contemporary philosophy are quite ready to solve. But there is a suggestion worth considering. As distinct structures, the amygdala and hedonic structures appear to have correspondingly distinct roles. The job of hedonic tone is to give us information about change in desire satisfaction; the job of the amygdala is to mediate innate fear responses and related emotional responses, and to support associative learning of new triggers for these responses. But as part of the ill-defined "limbic system," both receive signals, directly or indirectly, from the other, and send signals to the other. Perhaps it happens, then, that the amygdala can be triggered by cortical (and pre-cortical) representations, which is its primary role, but it can also be activated by gut-level expectations proper to the hedonic system. Perhaps, reciprocally, the hedonic system is designed to respond to gut-level expectations, but can also be activated by the amygdala. Then, in a given emotional episode, we would be justified in asking, not which system was responsible for the episode, but what role each system played in the episode: initiator or follower? The suggestion is one that warrants investigation, at least.

V. Conclusion

The path followed by this paper began as a straight highway of conceptual clarification and has ended up a track as convoluted as the surface of the brain itself. This is, I think, to be expected of work on the emotions, once it begins to ask not only "what is...?" but also "why

is...?” questions, questions such as, “Why do the emotions display certain characteristic features of modularity?” Though I confess to a certain amount of frustration with the almost endless complications of explaining why things happen in our brains the way that they do, I cannot really say that I didn’t expect it.

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