

CHAPTER 5

SYNAESTHESIA, FUNCTIONALISM AND PHENOMENOLOGY

Fiona Macpherson

“Synaesthesia” is most often characterised as a union or mixing of the senses.¹ Richard Cytowic describes it thus: “It denotes the rare capacity to hear colours, taste shapes or experience other equally startling sensory blendings whose quality seems difficult for most of us to imagine”.² One famous example is of a man who “tasted shapes”. When he experienced flavours he also experienced shapes rubbing against his face or hands.³ Such popular characterisations are rough and ready. What is certainly true about synaesthesia is that it involves the interaction between sensory phenomena: in response to certain stimuli some sensory phenomena are elicited in synaesthetes that are not elicited in non-synaesthetes. However, the exact nature of the additional sensory phenomena forms a large part of the debate on the nature of synaesthesia.

Synaesthesia is a condition that has been known about for some time. In the late nineteenth century, and early twentieth, century very many articles appeared on the topic in the psychological literature.⁴ Much of this work on synaesthesia relied on introspective reports of subjects. In consequence, when later in the twentieth century psychologists eschewed introspective reports and radical behaviourist methodology became the order of the day, synaesthesia was rarely a topic of research. In more recent times, however, psychology has once again changed tack. With the advent of cognitive psychology and of objective techniques that try to probe the nature of conscious states of the mind that are reported in introspection, psychological interest in synaesthesia has resumed. Many new findings about the subject have recently been brought to light.

In philosophy, interest in synaesthesia is only just beginning to arise. The phenomenon is potentially philosophically interesting for several reasons. One reason is that evidence about cross-modal phenomena may influence answers to questions that philosophers ask about how to individuate the senses, about the relationships between the senses, and about what the detailed characterisation of experiences in the different modalities should be. Another is because the sensory systems, such as vision and audition, are usually taken to be our paradigm of cognitive modular systems. Roughly speaking, modular systems are ones that cannot be rationally influenced by beliefs or other high-level cognitive states or even influenced by other parts of the perceptual system.⁵ Recently, philosophers and psychologists have debated whether synaesthesia consists in a breakdown in

modularity or whether synaesthetes have an additional perceptual module compared with non-synaesthetes.⁶

Psychologists are also investigating the nature of the synaesthetic experience. This is an interesting topic in itself, but the investigation also gives rise to philosophical interest. The question of whether, or to what extent, the nature of conscious states can be determined by empirical means is one that philosophers have long debated. Psychological methodology and suppositions should be scrutinised by philosophers who have long dealt with theoretical questions of this nature. At the same time, philosophers may gain new insights from the techniques that psychologists have applied to studying synaesthesia.

Lastly, new psychological phenomena can often provide evidence that philosophical theories of the mind ought to accommodate. If they cannot then the phenomena constitute counterexamples to those theories and they ought to be modified or abandoned. It has been claimed that synaesthesia constitutes a counterexample to functionalism; thus, philosophers ought to investigate this claim.⁷

These last two reasons as to why synaesthesia is of interest to philosophers are the ones that will be discussed in this chapter, the structure of which will be as follows: first, I will examine an influential definition of the phenomenon and suggest a better one that takes into account recent findings. I will then describe what functionalist theories of the mind are. Following this, I explain in detail the argument that synaesthesia provides a counterexample to functionalism.

I go on to question the argument on the grounds that there are versions of functionalism that are not challenged by the counterexample. I elucidate these types of functionalism. In addition, I claim that, if the argument is to work, it needs to be established that the synaesthetic experience can be identical to some non-synaesthetic perceptual experience. I look at the evidence for this claim and suggest that further work needs to be done to establish it.

1. THE NATURE OF SYNAESTHESIA

Harrison and Baron-Cohen offer a definition of synaesthesia. They claim that it occurs “when stimulation of one sensory modality automatically triggers a perception in a second modality, in the absence of any direct stimulation to this second modality”.⁸ The most common form of synaesthesia is “coloured hearing”, where certain sounds or spoken words trigger visual experiences of colour.⁹ However, many different forms of synaesthesia have been reported and it has been suggested that synaesthesia can occur between experiences in any two sensory modalities.¹⁰ (From now on, I will call the triggered experience the “synaesthetic experience”.) Note that, unlike some popular characterisations of examples of synaesthesia (as “hearing colours” or “tasting shapes”), the above definition does not suggest that a property normally experienced only in one modality is experienced as either being in a different modality or as being a property of some object or feature normally detected only by a different modality. It does not suggest, for example, that

in “coloured-hearing” colours are experienced to be properties of sounds. This is appropriate as there is no good evidence to back up this popular characterisation as will be shown below.¹¹

This common characterisation of synaesthesia, however, needs correction or supplementary comment in at least five respects. First, experiences in some sensory modalities can trigger synaesthetic experiences that are not in any of the traditional five sensory modalities (vision, audition, touch, taste and smell). The only cases of this reported are where the synaesthetic experiences are experiences of movement and bodily postures.¹² In light of this, one might wonder whether synaesthetic experience has to be confined to sensory experience. However, although the issue of what it is that makes some bodily process a sensory process is a complicated one, and one on which there is little agreement in the literature, it is commonly accepted that there are more than the traditional five sensory modalities.¹³ A sense of balance and a sense of the position of one’s body and movement of one’s body are obvious extensions to the traditional five modalities. Therefore, I would argue that the few synaesthetic experiences that have been reported that are not within the traditional five modalities are nonetheless experiences that lie within a sensory modality.

The second point is more important: the characterisation of synaesthesia is inaccurate in a key respect. It should not insist that synaesthesia must always be an inter-modal phenomenon. It has recently been reported that an experience in one modality can cause an additional experience or element of experience in the *same* modality.¹⁴ In such intra-modal cases, subjects report that a visually experienced grapheme elicits an additional experience of colour.¹⁵ For example, subjects may claim to experience different colours when they look at each of the letters of the alphabet that are all printed in black ink. These cases of grapheme-colour linkages are clearly treated as cases of synaesthesia in the literature. Indeed, much of the recent important experimental work on synaesthesia concerns such cases, as will become apparent below.

The third point to make about the definition is that it fails to take account of what we now know of the nature of the stimulus required to induce a synaesthetic experience. Many synaesthetes report that no physical stimulus is required to induce the synaesthetic experience; they only need to think of the synaesthetic stimulus in order for the synaesthetic effect to occur.¹⁶ This has been backed up experimentally by Dixon *et al.* who tested their subject, C, a grapheme-colour synaesthete, of whom it is claimed “activating the concept of a digit by a mental calculation was sufficient to induce a colour experience”.¹⁷ Dixon *et al.* carried out a variant of the Stroop test on their subject.¹⁸ The subject was presented with two digits separated by an arithmetical operator. To the right of the digits was a colour patch. The answer to the arithmetical problem was not given and, thus, required mental calculation. The subject was asked to name the colour of the colour patch. They took longer to name it when the patch’s colour was incongruent with the colour that was synaesthetically experienced in the subject in response to the solution to the arithmetical problem compared to when the patch’s colour was congruent. This suggests that a synaesthetically induced colour experience interfered with the colour naming in the incongruous conditions.¹⁹

Despite the strong evidence that some synaesthetes' synaesthetic experience is elicited not only in response to a sensory stimulus but also in response to merely imagining or thinking of that stimulus, there are some synaesthetes whose synaesthesia cannot be elicited by imagination or thought alone. In response to this finding, Ramachandran and Hubbard hypothesize that there are two distinctive groups of synaesthetes: higher and lower.²⁰ The higher synaesthetes have synaesthetic experiences in response to stimulation of the senses and also to imagination or thought of these stimuli. The lower synaesthetes' synaesthesia is triggered only by the former and not the latter. In addition, in lower grapheme-colour synaesthetes, it is only a specific type of grapheme that elicits the synaesthetic experience, for example, Arabic numeral "5" but not Roman numeral "V" could be the synaesthetic trigger. In contrast, in higher synaesthetes, it is frequently the case that an Arabic "5", a Roman numeral "V", and even just an appropriate number of grouped dots corresponding to the number five, will elicit (the same) synaesthetic experience.

Related to the first and the third considerations, there is recent evidence to suppose that in some cases of synaesthesia the relevant synaesthetic stimulus is an emotional response of the subject. Ward reports cases of synaesthesia where only emotionally eliciting stimuli, such as familiar people, the names of familiar people, and other words that have been objectively noted to typically produce emotional responses in people, induce synaesthetic colour experiences.²¹ Interestingly, a synaesthetic colour experience can come to be elicited in response to a person, when previously no such experience was elicited, when the person becomes more familiar to the subject. Another noteworthy fact is that the colour represented in the synaesthetic experience appears to depend on the emotion that the subject feels. As will be discussed in more detail below, synaesthetic connections appear to be constant throughout a person's life. These facts support the supposition that it is the emotion that is the synaesthetic trigger: the same emotions always evoke the same synaesthetic response, and stimuli that invoke emotions, such as people, will evoke different responses when they provoke different emotions. These cases suggest that the relevant stimulus is not primarily the stimulation of a sensory modality but, rather, is the stimulation of the emotional (often called affective) system.²²

The last point I will make about the above definition of synaesthesia is that it is not precise about the nature of the synaesthetic "trigger" or cause. The synaesthetic trigger was said to consist of "stimulation of one sensory modality". But what exactly does such stimulation amount to? The definition above is silent on this issue. We have already seen that mere imagining of a stimulus that typically invokes synaesthesia can, in some synaesthetes, trigger a synaesthetic experience. However, aside from this special case, what is known of the cause of the synaesthetic experience? Two options need to be contrasted in the first instance. The first option is that a conscious perceptual experience causes the synaesthetic experience. A second, and more demanding, option is that a conscious perceptual experience is required in order to have a synaesthetic experience but, in addition, the subject has to recognise what it is that their experience is of. In other words, both an

experience of something plus recognition of what it is that is being experienced is required to cause the synaesthetic experience.

There is some flatly contradictory evidence concerning which of these two options is correct. On the one hand, experiments in which a letter was briefly shown to a grapheme-colour subject, but which was masked by the presentation of another stimulus to stop the conscious recognition of the letter, yielded the results that the masked stimulus did not interfere with naming target colours in the way that would be expected if the masked stimulus had invoked a synaesthetic colour experience.²³ On the other hand, the perceptual “pop-out” experiments of Ramachandran and Hubbard, explained in detail below, suggest the opposite, as do their “crowding” experiments.²⁴ The latter experiments draw on the fact that a letter, when presented at the periphery of the visual field, is easily identified. However, when the letter is similarly presented, save for the fact that it is surrounded by other letters, it cannot be identified—it is “crowded”. Nonetheless, such crowded letters still elicit synaesthetic colour experiences in grapheme-colour synaesthetes, and, indeed, the colour experiences can be used by the synaesthetes to identify what the letter must be. This apparent contradiction can be resolved if the distinction postulated by Ramachandran and Hubbard (2001b), mentioned above, is correct. They claim that higher synaesthetes, in whom the very idea of the stimulus provokes a synaesthetic experience, may need to consciously identify a stimulus before it gives rise to synaesthetic experience; this may not be true of lower synaesthetes, in whom imagining or thinking of the stimulus does not induce a synaesthetic experience. Thus, the higher synaesthetes may require recognition, while the lower do not. Certainly, experimenters should be aware of the possibility of different types of synaesthesia and be mindful of this fact when designing experiments in order to test the nature of synaesthesia.

A third option, which stands in contrast to each of the above, ought to be mentioned. It might be that in the absence of a perceptual experience (or a perceptual experience together with the appropriate recognition of what is experienced) mere stimulation of some of the physical structures of the body (sensory organs, nerves or brain—those which are normally stimulated prior to one undergoing the non-synaesthetic effects) could cause the synaesthetic experience. The thought would be that in normal cases of synaesthesia, it is not the mental non-synaesthetic effects that cause the synaesthetic experience. Rather, both the synaesthetic experience and the mental non-synaesthetic effects have a common cause that consists in purely physical stimulation of the sensory organs, nerves or brain.

In my opinion, there is no good evidence for or against this third option. There are no studies that consider whether the physical activity in the central nervous system that normally precedes the non-synaesthetic perceptual experience (or that experience together with appropriate recognition) could, if prevented from causing the mental non-synaesthetic effects, elicit a synaesthetic experience. This is clearly one area where psychologists could investigate synaesthesia further experimentally.

It might be thought that the evidence in favour of either of the first two options above tell against this third option. However, this would be incorrect. The evidence for and against option one and two merely constitutes such evidence, on the assumption that one or other option must be true. It does not address what would happen if one were able to interfere with the causal chain that normally leads to synaesthetic and non-synaesthetic perceptual experience (or to that experience plus appropriate recognition) by intervening at the last point in the causal chain where it is possible to prevent the mental non-synaesthetic effects taking place. Thus, if this third option turned out to be the correct one, there would still be a question as to whether the mere physical activity in question was physical activity that was the normal precursor to the non-synaesthetic experience alone or the normal precursor to the non-synaesthetic experience together with the appropriate recognition of what seemed to be experienced.

All these results should be taken into account when trying to define synaesthesia, and I suggest that the best definition, in light of the above, is as follows:

Synaesthesia is a condition in which either:

- (i) an experience in one sensory modality, or
- (ii) an experience not in a sensory modality, such as an experience of emotion, or
- (iii) an imagining or thought of what is so experienced, or
- (iv) a mental state outlined in either (i)-(iii), together with recognition of what the mental state represents

is either a sufficient automatic cause of, or has a common sufficient automatic cause (lying within the central nervous system of the subject) with, an experience or element of experience that is associated with some sensory modality and is distinct from (i).

This synaesthetic experience or element of experience can be associated with the same or a different sensory modality from that which may be ordinarily associated with the mental state in (i)-(iv).

The reason for claiming that the causes in the definition are *sufficient* causes is to rule out cases of cross-modal illusions counting as cases of synaesthesia. One nice example of such an illusion is the McGurk effect.²⁵ A subject repeatedly is exposed to the same sound, such as “ba”. However, what the subject experiences depends on the lip movements that they observe that appear to be producing the sound. Observation of some lip movements, such as that corresponding to those made when saying “ba” (and observations of no lip movements), will result in the subject reporting the “ba” sound. Observation of other lip movements, such as those made when saying “ga”, will lead to reports of a “da” sound. In this case, the experience of the “da” sound is not caused by seeing the lip movement alone. It is

also caused by the auditory system processing the “ba” sound. The visual experience of the lip movement is therefore not a sufficient cause of the auditory experience. Thus, this case is not a case of synaesthesia. I believe that the distinction between cases of non-synaesthetic cross-modal illusions and cases of synaesthesia proper depends on the distinction between illusion (where we see something but misperceive it in one or more ways) and hallucination (where we see nothing and merely have an experience as if something were before us). To the extent that the distinction between illusion and hallucination is not sharp, neither will be the distinction between cross-modal illusion and synaesthesia.

A final point needs to be made about the above definition. The synaesthetic experience was said to be “an experience or element of experience that is associated with some sensory modality”. The definition is not more specific about the nature of the synaesthetic experience because there is a great deal of uncertainty about its nature. As we will see below, there is some evidence that the experience is most like perceptual experience and some that it is most like imaginative experience.

2. THE CHALLENGE TO FUNCTIONALISM

Functionalism is a theory in the philosophy of mind. At a first approximation, it says that what makes a state a mental state, and makes it the type of mental state that it is, is its causal role. The causal role of the mental state is comprised by the causes and effects of the state and these may include both physical and mental states or properties. Functionalists disagree about what the correct level of specification of the causal role should be. Candidates include the level of folk psychology, scientific psychology or neuroscience. The causal roles may either be thought of as wide (that is as extending outside the body and mentioning objects and properties in the environment of the subject) or as narrow (that is, extending only to the surface of the body or to some privileged part of the body such as the central nervous system). Some functionalists identify mental states with those states that play the causal role in question whereas others claim that mental states are higher-order states: to be in a mental state is to be in the state of having that causal role occupied by some state. For my purposes these differences will not be relevant.

An important and relevant distinction can be drawn between what I will call “strong” and “weak” functionalism. Weak functionalism claims that if two mental states are of different types then they will have different functional roles. Strong functionalism claims that if two mental states are of different types then they will have different functional roles and if two mental states have different functional roles then they will be different types. Mental states are of different types in virtue of a number of features. They are of different types if they are of different general kinds such as beliefs, desires, experiences, emotions etc. They are also of different types if they have different contents, that is, if they represent the world to be a different way. Thus, the belief that a cat is on the mat is a different belief from the belief that the dog is on the lawn. Mental states are also of different types if they have different phenomenal character.²⁶ (This certainly seems true in the case of

states such as experiences and sensations, which are relevant to this discussion.) There may be other features that distinguish types of states, but those need not concern us here.

Jeffrey Gray *et al.* have argued in a series of papers that synaesthesia provides a counterexample to functionalism.²⁷ It is clear that the functionalism they have in mind is strong functionalism.²⁸ The counterexample is one where the same type of mental state has different functional roles. Consider a sound-colour synaesthete who has a colour experience when they hear a certain sound. Suppose that the colour experience is of the same type that they would have when they look at a patch of red. Call this type of experience an experience of redness. According to Gray *et al.*, experiences of redness have two different functional roles in the synaesthete. When the experience is had synaesthetically, it is caused by a sound and by stimulation to the auditory system. When the experience is had non-synaesthetically it will, presumably, be caused by looking at a patch of redness and by stimulation of the retina and the other early parts of the visual system. Thus, the two experiences are of the same type but they have different functional roles, and this contradicts the claim of strong functionalism that if two mental states have different functional roles then they will be different types.

3. DOES THE CHALLENGE SUCCEED WITH REGARD TO THE CORRECT UNDERSTANDING OF FUNCTIONALISM?

Does Gray's argument succeed? In this section I argue that sophisticated versions of functionalism are not threatened by Gray's potential counterexample. Weak functionalism clearly escapes the potential counterexample. This fact will not undermine Gray's argument, however, because, as we have seen, his target is strong functionalism. Nevertheless, one ought to note that weak functionalism is a position that functionalists could hold and there seems to be no significant theoretical advantage gained from holding strong functionalism.²⁹ Even so, I think that there are at least two versions of strong functionalism that are not threatened by the alleged counterexample.

The first version is strong functionalism limited to a privileged functional role. The motive for such a position would be that if mental states are specified by their total actual functional role then almost no mental states would ever be counted as the same kind. For example, suppose that I have a visual experience of black and white stripes. On one occasion, this might cause me to think about mint humbugs. On another, the same type of experience might cause me to think of St. Mirren football team. The point is that the very same type of mental state can sometimes have different causes and effects. Similarly, because of the interconnectedness of mental states, it is very probable that, unless two people share all the same mental states, then a mental state that we would think that they have in common will, as a matter of fact, have different causal interactions. For example, the belief that the weather will be good tomorrow might cause me to believe that the fireworks will go ahead and you to believe that the barbeque will go ahead. (We might know of

different events taking place the next day.) Therefore, it seems that a certain part of the functional role of a mental state needs to be privileged as being the core role that any two tokens of the same type of that mental state must share. In relation to the *prima facie* counterexample above, what such a functionalist could do is hold that the core functional role of an experience of redness is the part common to the synaesthetic and non-synaesthetic experience. For example, this might be that such a state is caused by activity in area V4 of the cortex and gives rise to the belief that an experience of redness is being had. It could be argued that experiences of redness must have that functional role and any state that has that functional role is an experience of redness.³⁰

The second version of strong functionalism that is not threatened is strong normative functionalism. A significant feature of the definitions of weak and strong functionalism above is that they contain no normative element. However, many versions of functionalism do contain such an element.³¹ A normative functionalism would claim that what makes something a mental state, and the mental state that it is, is its *typical* causal role or the causal role that the state has *in optimal conditions*. A strong version of normative functionalism would say: in normal or optimal circumstances, if two mental states are of different types then they have different functional roles and if two mental states have different functional roles then they will be different mental states. This version of functionalism is not threatened by the counterexample because one could claim that, in the case of synaesthesia, conditions are not normal or optimal: synaesthesia is a case of malfunctioning. One could claim that, while the non-synaesthetic experience of redness plays a certain functional role, that type of experience in non-normal conditions can have the functional role of the synaesthetic experience of red. If one thought that mental states are to be identified with physical states that typically play a certain causal role, one could claim that the physical state that normally plays the functional role of the experience of redness plays a different functional role when a synaesthetic experience is had. The playing of the abnormal functional role, however, does not stop the state being identified as the one that in the normal case plays a different causal role: the one to be identified with experiences of redness.

In virtue of there being two kinds of strong functionalism that avoid the potential counterexample I suggest that Gray *et al.*'s argument does not challenge strong functionalism. However, an interesting question remains that will be discussed in the next section.

4. THE NATURE OF THE SYNAESTHETIC EXPERIENCE

Gray's challenge to functionalism assumes that the synaesthetic experience is identical to a non-synaesthetic perceptual experience of redness. This view of the nature of the synaesthetic experience is usually contrasted with the thesis that the experience is merely like one of imagination.^{32,33} What is the evidence that the synaesthetic experience is a perceptual experience, rather than an imaginative one?

Further philosophical interest in this question exists because it is worthwhile investigating what can be established about the phenomenal character of the synaesthetic experience. The question concerning what can be objectively established about subjective experiences is a well-known one in philosophy.³⁴

The first objective scientific tests for synaesthesia were consistency and Stroop tests.³⁵ Consistency tests traded on the fact that while synaesthetes vary greatly about what stimulus/synaesthetic experience pairings they have, each synaesthete always experiences the same pairings.³⁶ Synaesthetes were found to be more accurate in recalling these pairings than non-synaesthetes who had been instructed to invent and remember such pairings. This was true even when the synaesthetes, unlike the non-synaesthetes, were not warned that they would be retested and were retested after a much greater time interval than the non-synaesthetes. Details of the Stroop test and of the variants used to test for synaesthesia are in footnotes 18 and 19 above.

However, while this evidence shows that synaesthetes are different in some ways from non-synaesthetes, it is not very illuminating about the nature of the synaesthetic experience. For all the consistency experiment shows, professed synaesthetes may simply be having imaginative experiences that they have either learned to associate with a stimulus or that arise due to some other cause. Similarly, results from variants of the Stroop test show that grapheme-colour synaesthetic experience, whatever its nature, is automatic and can't be suppressed and that it interferes with colour naming, but it does not show that it is just like a perceptual experience. This conclusion is backed up by a study which found that non-synaesthetes trained to associate shapes with colour labels also displayed a large Stroop effect when asked to name the colours of such shapes when the colours were incongruent to the ones they had learned to associate with them. This shows that Stroop-effects can manifest themselves in the absence of an appropriate perceptual experience.³⁷

Empirical evidence in support of the idea that the synaesthetic experience is perceptual comes from two sources. The first is a number of experiments that try to establish that synaesthetic experience is perceptual by showing that the effects of the synaesthetic experience are like that of perceptual experience. These experiments all focus on grapheme-colour synaesthesia.

One controversial example is the pop-out experiments of Ramachandran and Hubbard.³⁸ Pop-out is the effect responsible for the fact that a target can be easily picked out from an array of distractors when the target is a different colour from the distractors. Synaesthetes were better than non-synaesthetes at identifying a target among distractors of the same colour when the target induced a different synaesthetic colour than the distractors, when given one second to do so. However, doubts about the methodology of these experiments have been raised by Rich and Mattingley.³⁹ Their doubts have been borne out experimentally by Blake *et al.* who showed that with speeded response times and an increasing number of distractors the synaesthetes results were unlike that of pop-out.⁴⁰

Another example is the recent experiment by Blake *et al.* that showed that rows and columns of identically coloured graphemes that induce synaesthetic colour

experience can induce the McCollough after effect, and was reported to do so by synaesthetes who did not know about the effect.⁴¹ This effect normally occurs when a subject looks alternately at, say, red columns and then green rows for several minutes. On being presented afterwards with an achromatic grating, subject reports that they see green columns and red rows.

This experiment, and ones like it, namely ones that try to show that the synaesthetic experience has the effects that perceptual experiences have, can only provide evidence for the perceptual nature of synaesthetic experience if it can be shown that the effects in question are only induced by perceptual experience. The kind of evidence that there is that only perceptual experience has these effects comes from empirical inductive evidence alone. Given that the evidence is of this nature, there is room for a philosophical sceptic to argue that synaesthetes could be the exception to the rule. The evidence does not conclusively prove that the synaesthetic experience is like perceptual experience. Perhaps synaesthetes' synaesthetic experiences are phenomenally just like imaginative experiences but that, unlike non-synaesthetic imaginative experiences, they can have effects that are typically thought to only be caused by perceptual experiences.

The second source of evidence comes from brain imaging studies. The most convincing of these appears to show that areas of (sound-colour) synaesthetes' brains known to be implicated in non-synaesthetically seeing colour (V4 or V8) are active when they hear sounds. This does not happen in non-synaesthetes, in particular, in those who have been trained to associate a sound with a colour and who are asked to visually imagine the colour when they hear the sound.⁴²

However, that evidence does not conclusively show that synaesthetes really have perceptual colour experiences. For how do we know that activity in such an area always causes perceptual colour experience? Even if activity in this area is usually correlated with such experience, this does not show that such activity is sufficient. Indeed, in the sound-colour synaesthetes it is known that area V1 is not active. However, V1 is active in the processes that lead to ordinary non-synaesthetic perceptual experiences of colour.⁴³ This might lead some to speculate that V1 is not required in order to undergo a conscious perceptual process. However, as the saying goes, one man's *modus ponens* is another man's *modus tollens*. One could as easily conclude that, as V1 is not active, the synaesthetes are not undergoing perceptual experiences.

To sum up, it seems apparent that the evidence above is empirical, defeasible evidence in favour of the synaesthetic experience being perception-like. It further seems that psychological and neuroscientific evidence in this domain will be of this kind. It is hard to imagine proof that would show conclusively what the synaesthetic experience was like. Given this, one might be sceptical of ever showing what the nature of synaesthetic experience is like conclusively. One might think that this backs up the pessimistic claim that there is something about the experience of others that will lie forever beyond our ken.

In contrast to this pessimistic conclusion, however, it ought to be remembered that the two sources of evidence converge and that they converge with a further piece of evidence: the reports of many synaesthetes.⁴⁴ It has recently been

reported that synaesthetes fall into two classes: associators and projectors. The former experience synaesthetic colours as being in their mind's eye or head. The latter experience them as projected in front of them in public space.⁴⁵ The latter kind of synaesthete appears to be reporting perceptual experiences.

One might conclude that the fact these different sources of evidence point to the same conclusion provides excellent evidence to believe that synaesthetic experience can be like perceptual experience, even if one admits that the evidence is still defeasible. We may never reach certainty in this area of enquiry, but we may amount a lot of evidence in favour of the same conclusion, in which case it seems that we ought to believe it. If this is right, then we ought to believe Gray's contention that synaesthetic experience can be just like perceptual experience.

Before concluding, however, one final point ought to be noted. Most of the evidence in this section that appears to support the claim that the synaesthetic experience is like perception only applies to intra-model grapheme-colour synaesthesia.⁴⁶ Yet, there is an extraordinary feature of this experience so far not mentioned. In grapheme-colour synaesthesia, we are supposing that a numeral "5", say, provokes a perception-like synaesthetic experience as of red. It is often claimed that the experience is such that the numeral looks to have the synaesthetic colour. At the same time, however, synaesthetes can tell what the colour of the ink is that such numerals are printed in, say, black. It is tempting to suppose that they can do this because the "5" looks black to them. Thus, it is tempting to think that the experience is such that the numeral looks to be both black and red at the same time! Indeed, introspective reports of projector synaesthetes back up this conclusion: "When probed about the locations of the two colors, A.D. reported that she didn't know how to explain it, but that both appeared on the shape in the same location at the same time".⁴⁷

The correct description of such experiences seems to be that the experiences represent two colours to be in the same place at the same time.⁴⁸ Can there be such experience? It may be that there cannot, in which case we must reach a better understanding of the synaesthetic experience. Alternatively, it may be that it is possible. In that case, we must think more carefully about what the phenomenal characters of such experiences might be like. Do they contain elements corresponding to the experiences of the colours that we are all familiar with or are they altogether different? Further empirical work needs to be carried out to establish as much as possible about the phenomenology of such experience. In addition, further philosophical work is needed to establish what sorts of experience it is possible for there to be.

Finally, note that these grapheme-colour synaesthetic experiences are not of the same type as any non-synaesthetic perceptual experience (which don't represent two colours in the same place at the same time). Thus, they cannot provide a counterexample to functionalism of the form that Gray's argument requires: two experiences being of the same type, yet having different functional roles. Yet, it is only in the case of these grapheme-colour synaesthetic experiences that the three types of evidence mentioned above converge on the conclusion that they are perceptual and, thus, only in these cases that a good case exists for synaesthetic

experience being perceptual. Therefore, it has yet to be shown, with much plausibility, that a synaesthetic experience exists that is both perceptual and identical to some non-synaesthetic perceptual experience. It follows that it has not been shown that a counterexample of the form that Gray's argument requires exists. Thus, it has not been shown conclusively that there is a counterexample to strong functionalism—even a basic, non-normative kind that does not privilege some core functional role.

5. CONCLUSION

The nature of synaesthesia is not yet fully understood. However, the evidence as to its nature is considerable and growing apace. I have discussed the nature of synaesthesia and given a definition of it that corresponds to what we know of the phenomenon at present. It should be noted that, in all likelihood, there are different kinds of synaesthesia and experimental work on the topic should take note of the different kinds that there might be and the relationship between them.

I have outlined and discussed Gray *et al.*'s argument that synaesthetic experience provides a counterexample to strong functionalism. I have argued that it does not on the grounds that there are versions of strong functionalism that are not affected by the argument. I have also argued that, in any case, the evidence that the synaesthetic experience is of the right kind, namely, the same as some non-synaesthetic perceptual experience, which Gray *et al.*'s argument requires is weak. The evidence that the synaesthetic experience is perceptual is only strong in the grapheme-colour case but such experiences appear to involve experiencing an object as having two colours at once, which does not happen, as far as we are aware, in non-synaesthetic experience. Thus, the argument that synaesthesia presents a counterexample to functionalism has been undermined in two respects.⁴⁹

NOTES

¹ See, e.g., Marks (1975); Cytowic (1993) and ([1995] 1997); Motluk (1994); Harrison and Baron-Cohen (1997); Gray, J.A. (1998); and Harrison (2001).

² Cytowic ([1995] 1997, p. 17).

³ Cytowic (1993) and ([1995] 1997, p. 21).

⁴ See Marks (1975) and Harrison (2001) for summaries.

⁵ A fuller statement of what it is for a system to be modular is given in Fodor (1983). See also this volume, p. 191. Of course, whether there are any cognitive modules is a question that has received much attention in the literature.

⁶ See Segal (1997); Gray, R. (2001a); Baron-Cohen *et al.* (1993).

⁷ A related claim has also been made that synaesthesia constitutes a counterexample to representationalism. This claim will not be examined here but has been debated in Wager (1999), (2001); Gray, R. (2001b).

⁸ Harrison and Baron-Cohen (1997, p. 3). This definition is widely cited in the literature.

⁹ Harrison and Baron-Cohen (1997).

¹⁰ See Cytowic (1993, p. 6). However, Harrison and Baron-Cohen (1997) claim that tactile perception causing auditory experiences is almost never reported. Similarly, Cytowic ([1995] 1997, p. 21) reports that smell and taste are very infrequent synaesthetic triggers or responses (despite his extensive study of taste as a synaesthetic trigger).

¹¹ Academics who endorse the common conception include Hurley and Noë (forthcoming) who cite as evidence only Marks (1975). However, although Marks does claim “Sometimes synaesthetic subjects report the associated visual sensation to appear not in visual space but rather in the sound itself” (p. 71), he gives no references as to where or when such reports have been made. Given that there are no other reports of this in the academic literature, this evidence is not convincing.

¹² See Cytowic (1993, p. 6) and ([1995] 1997, p. 21). In all other respects, these cases appear identical to that of other cases of synaesthesia, and are classed as cases of synaesthesia in the literature.

¹³ See, e.g., Rivlin and Gravelle (1984) and Keeley (2002). A recent exception is Nudds (2003). I am unsympathetic to his argument which stems from the thought that we ought to respect the common folk-psychological belief that there are five, and only five, senses.

¹⁴ See Mills *et al.* (1999); Dixon *et al.* (2000); Mattingley *et al.* (2001); Grossenbacher and Lovelace (2001); Ramachandran and Hubbard (2001a), (2001b), (2003); Rich and Mattingley (2002); Smilek and Dixon (2002).

¹⁵ A grapheme is a basic unit of written language, examples of which include letters, numerals and punctuation marks.

¹⁶ See Cytowic (1989, p. 49); Dixon *et al.* (2000); Ramachandran and Hubbard (2001a).

¹⁷ Dixon *et al.* (2000, p. 365).

¹⁸ The original Stroop test consists of words that are the names of colours, which are printed in ink that is either the colour the word refers to or a different colour. When the name of a colour is printed in a colour of ink other than the colour that the word refers to, subjects take longer to name the colour of ink that the word is printed in compared to when the name of a colour is printed in the same colour of ink that the word refers to. This effect is seen in the general population of perceivers.

¹⁹ Variants on the Stroop test are often used as objective tests for grapheme-colour synaesthesia. These variants exploit the fact that synaesthetes take longer to name the colour of the ink that words are printed in when the colour of the ink is incongruent to the synaesthetic colour that they experience in response to that word compared with the situation in which the ink is the same colour as the synaesthetic colour that they experience. They also take longer to name the colour of the ink in the incongruent case compared with people who do not have synaesthesia. See Dixon *et al.* (2000); MacLeod and Dunbar (1988); Mattingley *et al.* (2001); Mills *et al.* (1999); Odgaard *et al.* (1999); Wollen and Ruggiero (1983).

²⁰ Ramachandran and Hubbard (2001b).

²¹ See Ward (2004).

²² Of course the emotion may have to be induced by a stimulus that impacts upon the subject by means of the senses, but this does not stop its being the stimulation of the emotional system of the subject that is the relevant cause of the synaesthetic experience.

²³ See Mattingley *et al.* (2001); Rich and Mattingley (2002).

²⁴ See Ramachandran and Hubbard (2001a), (2001b), (2003).

²⁵ See McGurk and MacDonald (1976).

²⁶ The phenomenal character of an experience refers to the quality of experience in virtue of which there is, to use a familiar phrase "something that it is like" to undergo that experience. See Nagel (1974).

²⁷ Gray, J. A. *et al.* (1997), (2002); Gray, J. A. (1998), (2003).

²⁸ See, e.g., Gray, J.A. *et al.* (2002, p. 7).

²⁹ For example, the most plausible type of empirical functionalism holds that the folk-psychological roles of mental states reference fix on other finer-grained functional roles that it is the job of science to uncover. (See Braddon-Mitchell and Jackson 1996, p. 80.) If science uncovered two disparate fine-grained functional roles that played the coarser-grained folk-psychological role then one might conclude that the mental state in question was realised by two different functional roles. One might therefore affirm weak functionalism but deny strong functionalism.

³⁰ In fact I would not endorse this account as I believe that creatures not sophisticated enough to have belief can nonetheless have experiences of redness, but the functionalist will argue that some plausible account could be given.

³¹ See Armstrong (1970) who says mental states are "apt" to have certain causal roles, Lewis (1980) who says that mental states "tend" to have certain functional roles and Papineau (2000) who uses "normally" causes and "tends" to cause. (Note that Lewis's case of "mad pain" is similar in many respects to the case of the synaesthete. Here is a case where a philosophical thought experiment predicted in advance that cases such as that of the synaesthete could arise.) Whether "normally" should be taken as statistically normal or not will depend on which version of this view one finds most plausible.

³² This debate in the literature is normally conducted under the assumption that there is a sharp distinction to be made between perceptual experience and imaginative experience. In particular, I think that it is typically assumed that there is a difference of phenomenal character between a perceptual and an imaginative experience. However, the distinction may not be as sharp as some assume, and perceptual experience and imaginative experience may lie on a continuum. Nonetheless, I believe that there are clear phenomenal differences between perceptual experiences and imaginative experiences at either end of the continuum. For the purposes of this paper, I will assume either that there is a sharp distinction to be drawn or one is looking to distinguish cases at the far ends of the continuum that clearly exhibit differences. However, a full treatment of this issue would have to delve further into this debate.

³³ One might think that another counterexample to functionalism, of the same form as Gray's, could be generated if the synaesthetic experience were identical to some imaginative experience, for one could claim that some synaesthetic experience and some imaginative experience were identical save for the fact that they had different causal roles: synaesthetic experience is involuntary and is caused by another experience while a non-synaesthetic imaginative experience is voluntary and not caused by another experience. However, if there is a problem for functionalism here it is a problem with imagination more generally. It is very difficult to see how one could specify a causal role for imaginative experience. Non-synaesthetic imaginative experiences of the same type may or may not be voluntary. They may have all different sorts of causes and effects, which may or may not include perceptual experience or any other mental state. Synaesthesia, it seems, adds no new problem for functionalism here. This is backed further by noting that Gray *et al.*'s challenge is clearly meant to turn on the thought that synaesthetic experience is just like some perceptual

experience (of which it is more plausible that a full, strong and unrestricted version of functionalism can be given). Gray *et al.* clearly try to establish that there is evidence that synaesthetic experience is like perceptual experience.

³⁴ It is famously discussed in Nagel (1974) and many papers have been written on that topic since.

³⁵ See Baron-Cohen *et al.* (1987) and (1993); Dixon *et al.* (2000); MacLeod and Dunbar (1988); Mattingley *et al.* (2001); Mills *et al.* (1999); Odgaard *et al.* (1999) and Wollen and Ruggiero (1983).

³⁶ This is generally true of all forms of synaesthesia. There may, however, be common underlying patterns to which all synaesthetes conform, at least in one or two forms of synaesthesia. See Marks (1975). However, note that the evidence is rather weak and unclear.

³⁷ See MacLeod and Dunbar (1988).

³⁸ Ramachandran and Hubbard (2001a), (2001b) and (2003).

³⁹ Rich and Mattingley (2002).

⁴⁰ See Blake *et al.* (2005). They postulate that the synaesthete they studied “performs a serial-like search through the visual display, just like non-synaesthetic individuals” rather than experiencing pop-out but, in addition, and to explain the results by Ramachandran and Hubbard, “he was able to reject distractors more quickly using his synaesthetic colour” (p. 59).

⁴¹ See Blake *et al.* (2005).

⁴² See Nunn *et al.* (2002).

⁴³ *Ibid.*

⁴⁴ Until recently, psychologists included very little testimony from synaesthetes in their reports about the condition. This is starting to change. Some reports are included in Dixon *et al.* (2004, pp. 335-336); Cytowic ([1995] 1997, p. 23); and Harrison (2001, p. 104). Of course, it should be noted that we should not always take introspective reports at face value, and thus introspective evidence on its own ought not to convince us that synaesthetic experience is perceptual.

⁴⁵ See Dixon *et al.* (2004, pp. 335-336).

⁴⁶ All the first type of evidence, and most of the introspective evidence from the last couple of years, has pertained to grapheme-colour synaesthesia.

⁴⁷ Sagiv and Robertson (2005, p. 100). See also Blake *et al.* (2005, pp. 49 and 55).

⁴⁸ Note that this question is different from the question of whether two colours can be in the same time at the same place, which may be answered in the negative, while the former question is answered in the positive, without inconsistency.

⁴⁹ Thanks to David Bain, Michael Brady, Jim Edwards, Rebecca Lawson, Scott Love, Philip Percival, Mike Scott and Michael Tye for useful discussion, comments and references.