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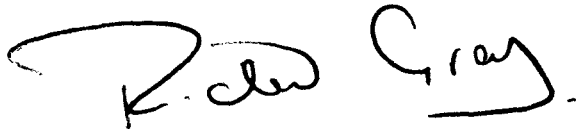
**SYNAESTHESIA:**  
***AN ESSAY IN PHILOSOPHICAL PSYCHOLOGY***

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Doctorate of Philosophy  
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2000

This thesis, which has been composed by myself, Richard Gray, is my own work, except where acknowledged to the contrary in the text, and has been submitted in partial completion of the degree of Doctor of Philosophy at the University of Edinburgh.

Handwritten signature of Richard Gray.

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## Preface

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I came across synaesthesia in summer 1997 in an issue of the electronic journal *Psyche* dedicated to the topic. At the time I was thinking about the phenomenal character of experience. The former seemed to offer a test case for philosophical theories of the latter. The upshot of that encounter was an early version of chapter 3, given as an informal talk to the Philosophy Department at Edinburgh University. Then I argued that synaesthesia seemed to constitute a counterexample to representationist theories of the phenomenal character of experience. Now, thanks in part to comments on that talk, I think synaesthesia rather indicates ways in which externalist theories of experience more generally need to be elaborated. More importantly, that encounter changed the focus of my attention to synaesthesia itself. There have been a couple of isolated references to synaesthesia in philosophical papers, and even a couple of philosophical papers on the topic (one very recent paper even defends the position I suggested in my talk), but no one (that I knew of) had dealt with different aspects of synaesthesia from a philosophical point of view in the same place. I am grateful to Timothy Williamson for his initial advice to concentrate on synaesthesia, and for many conversations on the topic. I am also indebted to Denis Walsh for helping me to see things differently at a number of places.

Considerable help has come from the responses of audiences at a variety of oral presentations of the ideas discussed here. Parts of chapter 4 were given as talks to the 1998 *Scottish Postgraduate Philosophy Association* spring conference at the University of Edinburgh, the 1998 *European Society for Philosophy and Psychology* annual meeting at Lisbon University and also at the University of London. Particular thanks go to Matthew Nudds who replied to the last. A version of chapter 2 was given at the 1999 *British Society for the Philosophy of Science* annual meeting at the University of Nottingham. A revised version of chapter 3 was given to the *Consciousness 2000* conference at the University of Arizona. Thanks go to friends, in particular, John Tresch and Joerg Tuske, and Ben Young and Alastair Renton, for

advice and solidarity over the last three years, to my parents and my brother James, who provided diverse forms of assistance, and especially to Alix Cohen for her special brand of encouragement and support.

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## Abstract

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We are sometimes led to a different picture of things when something unexpected occurs which needs explaining. The aim of this thesis is to examine a series of related issues in the philosophy of mind in the light of the unusual condition known to psychologists as 'synaesthesia'. Although the emphasis will be on the philosophical issues a view of synaesthesia itself will also emerge.

Synaesthesia is a distinct type of cross-modal association: stimulation of one sensory modality automatically triggers an additional phenomenal character of experience associated with a second sensory modality in the absence of any direct stimulation of the second modality. Chapter 1 introduces synaesthesia to a philosophical audience by outlining the early history of synaesthesia studies, by summarising contemporary research and by indicating areas of philosophical interest to be considered in the rest of the thesis.

Chapter 2 uses synaesthesia to examine one important philosophical model of the mind, Fodor's modularity hypothesis, and, in turn, investigates the nature of synaesthesia in the light of that model. Fodor claims that cognitive modules can be thought of as belonging to a psychological natural kind in virtue of their possession of most or all of nine specified properties. The most common form of synaesthesia possesses Fodor's nine specified properties of modularity, and hence it should be understood in terms of an extra cognitive module, and thus as belonging to the above-mentioned psychological natural kind. Many psychologists believe that synaesthesia involves a breakdown in modularity. A breakdown in modularity would also explain the apparent presence of the nine specified properties in synaesthesia. I discuss the two concepts of function which underlie the respective theories, defending the breakdown thesis, arguing, in any case, that properties deriving from evolutionary history should also be used to decide between the two theses and thus ultimately membership of a psychological natural kind such as Fodor suggests. The argument is then used to respond to two challenges to the notion of a psychological natural kind.

Chapter 3 focuses on the phenomenal character of synaesthetic experience. Externalists about the phenomenal character of experience tend to argue that the character of perceptual experience is to be explained either by the properties objects present to percipients, or by the properties objects are represented by percipients as having. Some internalists argue that there is a need to postulate further properties of the individual - in other words, qualia - to account for the individuation of the character of perceptual experience. The existence of additional phenomenal characters of experience in synaesthesia, which cannot directly be explained by reference to features of objects, suggests the existence of extra qualia and thus the presence of qualia in normal perception. The aim of this chapter is to meet the challenge presented by synaesthesia and the *extra qualia argument*, and contrariwise, use synaesthesia as a way of further clarifying the merits of the respective externalist positions.

In the previous chapters the locution of 'coloured hearing' will have been adopted. Occasionally the process underlying synaesthesia is described as one of 'hearing colours'. Chapter 4 rejects the latter usage. In so doing it focuses on the place of synaesthesia vis-à-vis normal perceptual processes. Considerations from previous chapters are further developed in order to shed light both on the metaphysical individuation of perceptual modalities and on how we know the distinctive perceptual modalities. Given the actual content of our concepts of perceptual modalities, it is argued that the actual world is one in which even synaesthetes are unable to hear colours. Consideration is given as to whether there is a possible world in which people could hear colours. The justification of the usage of 'coloured-hearing' then leads to a discussion of the relative importance of the individuating conditions of modes of perception.

The thesis focuses largely on coloured hearing. What merits the preceding considerations have might be supported if they can be generalised. Chapter 5 goes a small way in that direction.

## Chapter 1

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# Concepts of Synaesthesia

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### 1.1 *The Term 'Synaesthesia'*

The term 'synaesthesia' is derived from the union of two Greek words: 'συν' and 'αίσθησις'. (*Synaesthesia* is the form of spelling which will be adopted here. An alternative spelling, *synesthesia*, has common currency in North America.) The translation of neither of these words is altogether straightforward, nor, consequently, is the translation of their combination.

'συν' (alternatively written 'syn') is usually rendered into English by using one or other of the terms 'with', 'together' or 'alike'. 'αίσθησις' (alternatively written 'aisthesis') may be translated variously into English by the terms 'sensation', 'sense', 'perception' and 'sensory organ'.<sup>1</sup> 'αίσθησις' is at the root of another English word: 'anaesthesia'. The union of the word 'αίσθησις' with the prefix 'αν-' (or 'an-'), which can be translated as 'not' or 'without', denotes the absence of sensation, sense, perception or proper function of the sensory organ; it is used in particular of the process of artificially inducing an insensitivity to pain by the administration of drugs. The prefix 'an-' usually produces a straightforward modification in the meaning of the term it is attached to: it reverses the existing meaning. The prefix 'syn-' however often indicates a more complex modification of our concepts than the prefix 'an-': it means 'together' (e.g. in 'syndrome') or 'with' (e.g. in 'syntax') or 'alike' (e.g. in 'synonymy'). If the meaning of the word 'syn-' attaches to is also either vague or ambiguous, as it is in the case of the term 'aisthesis', then it is unclear what the concept expressed by the complex term is. Probably for this reason the term 'synaesthesia' has been used with a variety of meanings. Any study of synaesthesia must first be clearer about the meaning of the

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<sup>1</sup> Hamlyn 1961: chapter 1 notes the different uses of the word 'αίσθησις' in antiquity.

term 'synaesthesia' when it is being employed.

Although the term 'synaesthesia' derives from the Greek, and there is evidence that the term was indeed used in a philosophical context by the ancients - in the *Enneads* Plotinus used the term 'συναίσθησις' and its derivations<sup>2</sup> - there is no suggestion that ancient philosophy was acquainted with synaesthesia in the way that we are nowadays. It is not even clear, as the next section explains, that the ancients thought of perception in such a way that would have allowed for the relevant synaesthetic modification or association. The adoption of the union of the terms 'syn' and 'aisthesis' by Plotinus to refer to a different phenomenon from that referred to by the term today might be seen as adding some support to the view that the ancient Greeks would not have readily acknowledged synaesthesia as we do. The intended inference is that if 'syn' combined with 'aisthesis' denotes some kind of joining in perception, for the ancients it could only have been a joining of a different sort than the one recognised today: the sort better (although probably not entirely satisfactorily) denoted by our term 'consciousness'.<sup>3</sup>

The term 'synaesthesia' seems to have been first introduced with its modern meaning by the Swiss psychologist Flournoy. Calkins, the contemporaneous American psychologist remarked: 'The study of the varying forms of persisting abnormal associations, usually known as 'colored-hearing' and 'forms', but grouped together by Théodore Flournoy, under the convenient name Synaesthesia, has hardly as yet completed the stage of scientific observation'.<sup>4</sup> The classification to which the preceding quotation refers occurs in the following passage of 1893, although here it seems to be an endorsement of a still earlier usage: 'De toutes les autres dénominations que j'ai rencontrées, celle de visuel synesthésie me paraît la plus adéquate et la moins encombrante. Elle évoque à côté d'elle les expressions parallèles

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<sup>2</sup> See for instance *Enneads* I 1,11,11; III 8,4,19; IV 3, 26,45; V 4, 2,18 and V 6,5,3. I have Alix Cohen to thank for pointing this reference out to me.

<sup>3</sup> Some commentators cite Pythagoras' reference to the 'Music of the Spheres' and Aristotle's reference to the relationship between the harmony of sounds and the harmony of colours with respect to synaesthesia. See for instance Marks 1975 reprinted 1997. But the relationship of such themes to what we know as synaesthesia is tenuous at best.

<sup>4</sup> Calkins 1895: 90.

de synesthésies auditive, olfactive etc. pour désigner les phénomènes analogues.’<sup>5</sup>

Since the end of the nineteenth century the word ‘synaesthesia’ has been adopted by a number of different fields of research to denote a number of disparate phenomena. *The Oxford English Dictionary* records that in 1901 the term ‘synaesthesia’ began to be used to refer to cross-modal metaphor. We commonly describe some colours (e.g. yellow, orange and red) as ‘warm’ and other colours (e.g. blue and green) as ‘cool’. Similarly we sometimes describe some colours as ‘loud’. Conversely we might describe some sounds as ‘colourful’. Or we might describe a sound as ‘sharp’. And relatedly we might describe smells as ‘sweet’.<sup>6</sup> The cross-modal association which Flournoy refers to by the term ‘synaesthesia’ is to be distinguished from cross-modal metaphor, although the question of how distinct the two phenomena are and what the precise relationship between them is will recur several times in the present chapter. On a slightly different track the 1972 edition of *The Dictionary of Language and Linguistics* defines synaesthesia as: ‘the association of a particular sound or group of sounds with a particular meaning, e.g. fl- in flare, flicker, flame’. According to linguistics synaesthesia is a form of phonetic symbolism, whereby some phonemes are appropriate to the representation of objects of particular non-auditory experiences. (The explanation for such associations is not clear, but they might be related to metaphorical associations. Alternatively there might be features common to visual and auditory experiences.) And, more idiosyncratically, Ogden and Richards used the term to refer to a certain class of experiences which were ‘most removed from analytic and abstract attention’.<sup>7</sup>

Flournoy’s study of what he called ‘synaesthesia’ (and what we shall be concerned with here) came in the wake of a growing number of published case studies all reporting subjects who underwent experiences with unusual additional features.

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<sup>5</sup> Flournoy 1893: 5. ‘Of all the other terminologies that I have come by, that of visual synaesthesia seems to me the most fitting and the least burdensome. It evokes the parallel expressions of auditory synaesthesia, olfactory synaesthesia etc. to denote the analogous phenomena ...’ Segalen 1981: footnote 1 states that the term ‘synaesthesia’ is actually due to Millet.

<sup>6</sup> See Day 1996 for a discussion of such metaphorical usage. He calculates that whilst the most common form of synaesthesia studied by psychologists relates colours to auditory stimuli, the most common form of metaphor in literature relates tactile properties to auditory sensations.

<sup>7</sup> See Ogden & Richards 1985: 156.

Although there was a consistency in many of the reported features, many of the papers and reviews had also been at variance as to an explanation. Some claimed that they were the result of psychological processes in which two stimuli had become associated, so that the experience of another token of one type of stimulus would automatically generate an experience of the other type of stimulus in the absence a token of the latter. Some claimed that these cases were the result of physical disorders, perhaps brought about by damage to the sensory systems or to the brain. Moreover, it was not clear that the different case studies were in fact manifestations of a single general condition. These substantive disagreements were usually accompanied by terminological disagreements. At the *International Conference of Physiological Psychology* in Paris in 1890, a committee of seven leading psychologists was organised to collate and examine the evidence. Flournoy had been one of the members of that committee. The study of synaesthesia he published in 1893 was his own response to the debate.

The purpose of the present chapter is to introduce the concept of synaesthesia as it is currently employed in psychology. Section 1.2 discusses some historical issues. Section 1.3 traces out some of the events leading up to and following on from Flournoy's terminological endorsement. Given the extensive nature of the early literature on synaesthesia it cannot be reviewed here in its entirety. The aim will be to outline the emergence of synaesthesia as a scientific phenomenon. Sections 1.4 and 1.5 summarise the principal findings and theories, which have signalled the contemporary resurgence of interest in synaesthesia. Section 1.4 considers and rejects the view that the psychological processes underlying synaesthesia are not different in kind but only in degree from processes non-synaesthetes exhibit. Section 1.5 outlines the recent evidence, which strongly suggests that synaesthesia is indeed a distinct psychological process (with underlying physiological causes). Section 1.6 presents what I take to be some of the most prominent issues which synaesthesia raises for philosophy and which will be considered in the rest of the thesis.

## 1.2 Historical Issues

Many philosophical issues can be traced back to antiquity. Although the term ‘synaesthesia’ derives from the Greek there is little hope of trying to trace our present understanding of synaesthesia back to the ancients. Why there is not may be found by looking at some well-known early theories of perception. It is soon apparent that none of these could satisfactorily accommodate the possibility of synaesthesia. This may be no surprise. The elementary nature of many aspects of ancient psychology is well-known. The discussion of philosophical issues related to modes of perception were less elementary and these set the stage for later discussion, in particular, concerning the individuation of sensory modalities.

Aristotle provides as sophisticated an account of perception as is to be found in classical philosophy. One of the most detailed statements of Aristotle’s account of perception can be found in *De Anima*. The second half of book two deals in detail with the sensory modalities. (‘Sensory modality’ can be taken to denote a distinct way in which something can be perceived by a creature. One might also talk about a ‘sense’ for short.) For Aristotle the sensory modalities were limited to five: sight, hearing, smell, taste and touch. A short preceding chapter (chapter six) outlines some general features of perception and the sensory modalities.

Aristotle classified the objects of perception into three types: special-objects, common-objects and incidental-objects of perception. The special-objects and the common-objects are perceived in themselves, ‘of the two, one is special to each sense, the other common to all’.<sup>8</sup> The special-objects can only be perceived by a particular sensory modality (hence special-objects) and must be so perceived in using that sensory modality; ‘in themselves’ does not mean that special-objects are directly perceived but that they are essentially related to particular senses. According to Aristotle, if we perceive something by means of sight then that thing cannot be for

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<sup>8</sup> Aristotle, *De Anima*, 418a7-11. I shall keep to Aristotle’s terminology here. But one should distinguish between perceiving common objects and perceiving common properties (or sensibles). The one object might be perceived by different senses in virtue of different perceptible properties. We may perceive the one dog by hearing it, seeing it, smelling it or touching it. One can imagine that no common properties are perceived. If shape were a property of an object it might be perceived by different senses: a common sensible.

example a sound, we can only perceive colours by sight and we must perceive colours when we see. If we perceive something by hearing then that thing cannot be for example a colour, we cannot perceive colours by hearing, we can only perceive sounds and we must perceive sounds when we hear. And so on for the other modes of perception and their special-objects. The justification for this view seems simply to be that 'it is impossible to be deceived'; the senses are incorrigible with respect to their special-objects, a sense is not able to confuse its special-object with the special-object of another sense. Vision cannot confuse a colour it perceives with a sound which is perceived. Hearing cannot confuse a sound it perceives with a colour which is perceived. Hamlyn has remarked that it is not clear what Aristotle had in mind by making the point that a sense cannot confuse its special-object with that of another sense, since the incorrigibility is not that which philosophers have attributed to the perception of sense-data, unless it is a straightforward conceptual point that 'we cannot, logically, smell sounds'. But this, in turn, seems to be based on the metaphysical view that sounds are essentially related to hearing. Another interpretation is that Aristotle is here distinguishing such cases of inter-modal discriminations, where one seems always to be able to discriminate, for example, a colour which is seen by means of the eyes from a sound which is heard by means of the ears by reference to the respective sensory organs, from such cases of intra-modal discriminations, which are not usually to be made with reference to their correlative sensory organs and where we can be mistaken in the discriminations we make (e.g. we may be mistaken about whether an object has one colour rather than another colour).<sup>9</sup>

Modes of perception, on this view, can be individuated by their special-objects. Although it might be just as true to say that, for Aristotle, each class of special-object is individuated by the distinctive nature of each sensory modality. Objects, which are common to the senses, include movement, figure, shape and size. Movements and shapes are perceptible by both touch and sight. Aristotle seems to

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<sup>9</sup> Aristotle deals cursorily with misperception at 428b.17. Here he claims that perception is liable to falsity 'to the least possible degree'. It is easier to be deceived about incidental objects of perception and still easier to be deceived about some common objects of the senses.

allot a distinct sense for the common-objects, which are also perceived in themselves. Although he allows that common-objects are sensed via the organs of sight and touch it is not the essential nature of those organs to perceive the common-objects of perception, which is why Aristotle can say that vision only perceives colours.<sup>10</sup> An object of perception is incidentally perceived if the special-object of perception is also something else e.g. the son of Diares; Diares would, according to Aristotle, be perceived incidentally to the whiteness of the clothing he is wearing. According to Aristotle 'it is the special-objects, which are objects of perception properly, and it is these that the essence of each sense is naturally related'.<sup>11</sup> As Hamlyn notes it is not clear why the special-objects should be the 'objects of perception properly'. There seems no reason why the common-objects should not also be considered as 'objects of perception properly' if they have a correlative faculty, the common sense. Aristotle is clearer as to why it is that the special-objects to which each sense is naturally related are so related. It is this which excludes the possibility of synaesthesia in Aristotle's account of the mind. The mechanisms of perception, which necessitated the relation between the distinct senses and their special-objects, will be considered shortly. This essential relation, as Aristotle is fully aware, can be traced to earlier philosophers.

An earlier statement of the idea that each perceptual modality has its correlative class of objects can be found in Plato's *Theaetetus*. In the words of Socrates: 'then there are the perceived things; all sorts of colours for all sorts of cases of seeing; a similar variety of sounds for cases of hearing; and so on and so forth, every perceived thing being compatible with a perception'.<sup>12</sup> Later in the same dialogue the strength of the relation between perceptual modalities and their correlative objects is emphasised: 'what you perceive through one power, you cannot perceive through another - for instance, what you perceive through hearing, you could not perceive through sight, and similarly what you perceive through sight you could

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<sup>10</sup> There is actually debate about this. Some argue that Aristotle postulates a separate common sense. Others argue that he does not; common objects are perceived by a capacity which is common to the senses.

<sup>11</sup> Aristotle, *De Anima* 418a24.

<sup>12</sup> Plato, *Theaetetus*: 156c.

not perceive through hearing?’<sup>13</sup> It is difficult to be clear about Plato’s own position on the nature of perception in his dialogues. There is a lengthy statement in the *Theaetatus*, which seems to be the view endorsed by Protagoras. Protagoras also held that there is an essential relation between the diverse sensory modalities and their special-objects, although Protagoras, Plato and Aristotle all seem to have disagreed as to how the relation is precisely realised. According to Protagoras, to each of these special-objects of perception corresponds a special organ of perception. In combination they form a mode of perception:

So, for instance, consider an eye and something which is close to the eye and compatible with it, as they engender whiteness and the perception which is naturally adapted to whiteness, which are the unique offspring of the eye and the other object in this relation. At this precise moment, the seeing is set in motion from the eyes and the whiteness is set in motion from the object which is the colour-generating half of the pair (both these offspring arise between the eye and the object); the eye becomes filled with sight, and sees at this time, and becomes not sight but a seeing eye; and the object which is the colour-generating half of the pair becomes filled with whiteness and, again, becomes not whiteness but white. The object which happens to be coloured by this colour could be a piece of wood or a stone or anything at all.<sup>14</sup>

Further treatment of the mechanism of visual perception is to be found in the ‘creation myth’ of the *Timaeus*.<sup>15</sup> Seeing takes place when the pure fire within the body which flows through the eye coalesces with its like outside the body, thereby forming a line of sight between the object and perceiver. Parallel accounts are given of the other sensory modalities. Sounds are perceived when impulses given by the air through the ear to the brain are passed on to the soul. Smells arise when air turns into water or water turns into air and the result of this affects the ‘whole cavity between crown and navel’. Different tastes arise from the different actions of various substances upon the ‘discriminatory passages which extend from tongue to heart’.<sup>16</sup>

Related remarks can be found in the Presocratic philosophers. The view of Empedocles, according to Theophrastus, seems to make the interaction between

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<sup>13</sup> Plato, *Theaetetus*: 185a.

<sup>14</sup> Plato, *Theaetatus*: 156d.

<sup>15</sup> The *Timaeus* is a late dialogue and it discusses many of the new ideas prevalent at the time. The views are not far removed from those of Protagoras.

<sup>16</sup> Plato, *Timaeus* chapters 13 & 31-36.

sensory organ and object of perception uni-directional. Empedocles is nevertheless able to account for the different sensory modalities. Effluences are given off by objects and affect the various sensory organs. Perception arises when something fits into the passage of any one of the senses. One sense is not able to perceive the objects of another sense because the passages of the different sensory organs are of different dimensions. If they are too narrow then objects cannot fit into them, if they are too wide then things pass straight through them without making contact with them. Hence modes of perception and objects of perception are once again taken to be essentially related.<sup>17</sup>

The atomists further refined the view of Empedocles. They held that atoms and the void are the fundamental constituents of the universe. All perception had to be explained in terms of these, more specifically in terms of contact between them. Leucippus describes the effluences, expounded by Empedocles, as different kinds of images which are given off by objects and which affect the different kinds of sensory organs. Democritus believed that visual images in the eye arose from both the seen object and the observer. Visual image and seen object meet and form an impression in the air which then enters the pupil of the eye. Different perceptual modalities are supposed to arise from the different congruences of shape and size between the atoms in the head and those from outside the head.<sup>18</sup>

All of the above views express a line of thought in which one sense can only perceive the objects suited to it. There seems nothing obvious one might object to in this. Synaesthesia is not claimed (by most) to be the process whereby colours are heard or sounds are seen. The point is that nowhere in the causal mechanisms of perception which these philosophers advanced is their allowance made for the possibility of synaesthesia. If a perceptual experience of a colour only occurs when atoms of the appropriate size unite, and only atoms of the appropriate size can unite, then it is not possible for an atom, which contributes to an auditory experience, also to contribute directly to the experience of a colour. Similarly if a perceptual experience of a colour only occurs when an eye and something which is close to the

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<sup>17</sup> Theophrastus, *De Sensu* 7, Kirk & Raven 1957: 343.

<sup>18</sup> Theophrastus, *De Sensu* 49-83, Kirk & Raven 1957: 421-424.

eye and compatible with it engender whiteness and the perception which is naturally adapted to whiteness respectively, then it is not possible for whatever produces a sound to generate an experience of a colour.

The perceptual mechanisms which Aristotle himself advances are complex. The elements of his theory can be found in the final chapter of book two of *De Anima*. Aristotle claims that the senses are that ‘which can receive perceptible forms without their matter’.<sup>19</sup> How is this possible? The concept of a sense is to be distinguished from the concept of a sensory organ. Sensory organs are material objects. They are also that in which the potentiality to perceive resides. According to Aristotle, what is perceived must be ‘a particular extended magnitude, while what it is to be able to perceive and the sense are surely not magnitudes, but rather a certain principle and potentiality of that thing’.<sup>20</sup> Senses are taken to be the formal principles, which actualise the potentiality of sensory organs in virtue of the potentiality of the senses to perceive. This combination of sense and sensory organ, the actualisation of a potentiality, thus gives rise to a further potentiality. This second potentiality is a potentiality to receive the forms of perceptible objects without their matter in virtue of the formal isomorphism of the potentialities of the sense and the forms of the objects they are related to. The actualisation of the potentiality of a sense, according to Aristotle, occurs when the sense is affected by objects around it. An explanation is thus given for Aristotle’s earlier claim that ‘that which can perceive is potentially such as the object of perception already is actually. [The sense] is not like the object, then, when it is being affected by it, but once it has been affected by it, it becomes like it and is such as it is’.<sup>21</sup> Special-objects of perception can thus only actualise the potentiality of related sensory organs and senses. No special-object of perception is able to actualise the potentiality of a sense other than the one it is essentially related to.

Aristotle does discuss some processes in which the senses are associated. Could these be used as possible explanations of synaesthesia? Joint perception (when

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<sup>19</sup> Aristotle, *De Anima*, 424a17.

<sup>20</sup> Aristotle, *De Anima*, 424a17.

<sup>21</sup> Aristotle, *De Anima*, 418a3.

we see the colour and taste the flavour of something at the same time) can be quickly discounted. There is no suggestion here that either one of the special-objects causes the perception of the other. Aristotle discounts the possibility that we could be muddled about this and fail to discriminate the senses that perceive the special-objects. Recognition of a special-object we have perceived in the past via a different sensory modality (we recognise that something is tasty when we see it: we see it is tasty) can also be discounted. The one experience may produce a certain representation of the other, an object may be seen to be tasty without one having tasted it. But this is only because one remembers what it's like to be so: when I see that the fruit is tasty it is only because fruit that has looked the same way has turned out to be tasty. It is a different sort of association from synaesthetic associations; there need be no experience of flavour in such recollections. What of the common-sense. Perhaps colours are common-sensibles which can be perceived by both sight and hearing? But that possibility is plainly contrary to what Aristotle has taken so much time arguing for.

Aristotle, it is true, mentions certain 'likenesses' amongst the senses: the likeness of the harmony of colours and the harmony of music (colours may stand in relation to each other in the same manner as concords do in music) and the likeness of the properties of sharpness and flatness in hearing and in touch.<sup>22</sup> But this refers to a parallel between the senses, not an association of the kind we are interested in. There seems to be no part of Aristotle's account of perception, which allows for the special-objects of one sense to actualise the form of another kind of special-object of perception in the sensory organ appropriate to the latter special-object.

Part of the difficulty for Aristotle and his predecessors is that they do not or cannot make clear the distinction between colour and the awareness of colour, sound and the awareness of sound, and so on for the other sensory modalities. Another difficulty was that neither Aristotle nor his predecessors had any coherent way of explaining perceptual anomalies. And, of course a further difficulty is that they had no significant knowledge of the functional role of the brain, placing perceptual processes

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<sup>22</sup> Aristotle, *De Sensu et Sensili*, 7.

in the sensory organs. Progress in these areas had to wait until advances in philosophy and science in the seventeenth century.

Locke has been credited with one of the first references to synaesthesia. Baron-Cohen and Harrison are clear about the priority they give to Locke. This citation may derive from Marks. The reference to Locke finds echoes in other recent work by Cytowic and Dann. Dann notes correctly that Locke is not referring to synaesthesia, but he mistakenly identifies the reference with Locke's commentary on the Molyneux' problem: 'Although Locke's comments are frequently cited as an early example of scientific interest in synaesthesia, the passage in question is really Locke's reformulation of the eighteenth century philosophical conundrum known as the Molyneux problem: if a man born blind were to gain his sight in later life, would he be able to identify the objects around him, by sight alone?'<sup>23</sup>

The passage of interest occurs in book III of *An Essay Concerning Human Understanding*, where Locke is in the process of explaining the relationship between words and simple ideas:

A studious blind man, who had mightily beat his head about visible objects, and made use of the explications of his books and friends, to understand those names of light and colours, which often came his way, betrayed one day that he now understood what 'scarlet' signified. Upon which, his friend demanded what scarlet was, the blind man answered, it was like the sound of a trumpet. Just such an understanding of the name of any other simple idea will he have, who hopes to get it only from a definition, or other words made use of to explain it.<sup>24</sup>

They who suggest this passage as an early reference to synaesthesia choose to ignore the lines immediately preceding:

For to hope to produce an idea of light or colour by a sound, however formed, is to expect that sounds should be visible, or colours audible; and to make the ears do the office of all the other senses. And therefore he that has not before received into his mind, by the proper inlet, the simple idea which any word stands for, can never come to know the significance of that word by any other words or sounds whatsoever, put together by any rules of definition. The only way is by applying to his senses the proper object, and so producing that idea in him, for which he has learned the name already.

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<sup>23</sup> Baron-Cohen & Harrison 1997: 4, Marks 1997: 67, Cytowic 1993: 52 and Dann 1998: Introduction.

<sup>24</sup> 1690: bk.3, ch.4, sect. 11.

Locke is, in effect, here drawing a distinction between knowledge by acquaintance and knowledge by description. A comparison of this passage with an earlier passage corroborates the view that Locke was not referring to synaesthesia, but emphasising his empiricist credentials. According to Locke, it is only possible to acquire the ideas of distinctive types of perceptible properties of objects if one has had experiences of them and one can only do this via the appropriate sensory modalities. Locke's account of the distinctive types of ideas of perceptible properties of objects finds first expression when he writes: 'some ideas [...] have admittance only through one sense, which is peculiarly adapted to receive them. Thus light and colours, as white, red, yellow, blue, with their several degrees of shades and mixtures, as green, scarlet, purple, sea-green, and the rest, come in only by the eyes. All kinds of noises, sounds, and tones only by the ear. The several tastes and smells by the nose and palate.'<sup>25</sup> The ideas of perception are mental items, which are enabled by distinct properties of objects via intermediate entities (lightwaves and soundwaves) the properties of objects cause to behave in a determinate way. Different types of ideas are enabled in different ways. In the case of our ideas of primary qualities (such as bulk, figure, number, situation and motion) Locke claims that these mental items are faithful copies of the originals. For properties, such as bulk, figure, number, situation and motion belong to objects, independently of whether we are perceiving them, in the way that these mental items represent them to be. Consistent with this is the notion that the ideas of primary qualities are enabled by primary qualities in such a way that they can be mediated by a number of different senses. For example, the idea of shape can be enabled both by the sense of vision and the sense of touch. The ideas of secondary qualities (such as colours, sounds, smells and tastes), in contrast, are enabled in such a way that they can only be mediated by distinct senses. In the case of our ideas of secondary qualities, Locke claims, furthermore, that these mental copies are not faithful to the originals. For these properties do not belong to objects in the way that our ideas of them represent them to be. Secondary qualities are powers or dispositions (dependent upon related primary properties) to affect our senses. (Might not

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<sup>25</sup> 1690: bk. 2, ch. 3, sect. 1.

synaesthesia, on first view, seem to support Locke's view of secondary qualities: sounds enable experiences of colours, which do not resemble those sounds?) From these remarks, it should be clear that, just because he was blind, the blind man could not know what the idea of red was and therefore could not understand what the term 'red' denoted.

Indeed, it might be thought that the possibility of synaesthesia is ruled out as a coherent consideration by what Locke also says about perceptual mechanisms: 'And if these organs, or the nerves which are the conduits to convey them from without to their audience in the brain, the mind's presence-room (as I may call it), are any of them so disordered as not to perform their functions, they have no postern to be admitted by, no other way to bring themselves into view, and to be perceived by the understanding.'<sup>26</sup> From this it seems that ideas, for Locke, are generated in the sensory organs (or sensory systems). If the sensory organs are not functioning or the brain is damaged in some way then the mind cannot become acquainted with the ideas of a particular sense. Locke fails to allow the possibility that the brain might also be disordered in such a way that the one sense might help to deliver the idea of a different sense to the mind. In this respect, the actuality of synaesthesia can be seen to highlight inadequacies in the details of Locke's theory of perceptual experience.

Further support, if it were needed, for the view that the above passage does not illustrate a case of synaesthesia comes from the lack of corroboration to be found in the reply Leibniz gave to Locke in his *New Essays on Human Understanding*. In fact, Leibniz adds his own twist: 'We cannot know the taste of pineapple by listening to travellers tales, unless we can taste things by the ears - like 'Sancho Panza, who had the faculty to see Dulcinea by hearsay', or like the blind man who, having heard scarlet described as a blazing colour, thought it must be 'like the sound of a trumpet'.' The relevant reasoning is by analogy. The blind man is acquainted with the idea the sound of trumpets enable in him. The sound trumpets make is described as 'blazing'. Red is also described as a blazing colour. Therefore, what it would be like to be acquainted with the idea of redness is similar to what it is like to be acquainted with

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<sup>26</sup> 1690: bk. 2, ch. 3, sect. 1.

the idea the sound trumpets enable. The reasoning is fallacious since our ideas of secondary qualities can only be enabled by the appropriate senses. Leibniz makes one further reference to the association between scarlet and the sound of a trumpet in his response to Locke's remarks on solidity. His point here is that usually people perceive just one clear idea of a sensible property. If a person were to have more than one idea (or their ideas were indistinct), then they would not be able to communicate with others. They would be in a position similar to that of the blind man who is unable to understand the notion of colour.

The foregoing are some of the reasons for thinking Locke is not a good candidate for providing an early reference to synaesthesia. This still leaves the question open, if the reality of synaesthesia is admitted, of whether the blind man could understand the colour words, or, at least, have colour concepts. Of course, a blind synaesthete would not have colour concepts as the sighted do, nor would he have perceptual concepts in the way that he has concepts derived from other sensory modalities, nevertheless, it seems plausible to suggest that he might acquire a range of concepts of some kind. The problem is unlike the Molyneux' problem. The issue is not, as is the Molyneux' problem, one of whether the concept of a perceptible property, which has already been acquired on the evidence of one perceptual modality, can then be applied to the perceptual experience derived from another perceptual modality through which the concept of that perceptible property cannot have been acquired. The problem of the blind synaesthete would be one of the kind of concept that could be acquired where the concept in question is usually acquired by a different sensory modality.

It remains a matter of contention, and of some confusion, who first referred to a case of synaesthesia as a distinctive condition. Marks suggests Woolhouse, a near contemporary of Locke, as another possible candidate for priority. Woolhouse is supposed to have reported a case of a blind person who was nevertheless able to experience colours on hearing sounds.<sup>27</sup> But it is by no means clear that this is a genuine case of synaesthesia. That it is not a genuine case of synaesthesia is even

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<sup>27</sup> Marks 1997: 51. The claim is repeated by Cytowic 1993: 52. Clavière refers to Castel without referring to Woolhouse.

suggested by the fact that it was cited by Castel in 1735, whose own interests were in quite a different phenomenon. Castel was interested in establishing Isaac Newton's idea that the seven colours of the spectrum and the seven intervals of the musical octave were mathematically related. As a part of this project Castel had already made an instrument, a type of organ, which produced colours and sounds simultaneously. Synaesthesia would not have added any direct support for this claim, for the postulated relation Castel was intent on establishing was supposed to hold between colours and sounds, whereas, whatever synaesthesia is, it is a complex relation holding between colours and sounds only in so far as it is mediated by a particular person's experience.<sup>28</sup>

Goethe disagreed with Newton about the relationship between sound and colour. Goethe believed that, although sound and colour might ultimately derive from the same source, in the empirical world they have no direct relation. Goethe also disagreed with Newton about the latter's neglect of the experience of colour in any account of colour. So it is more reasonable to think that Goethe might provide an early reference to synaesthesia. This is indeed suggested by Krohn, on the basis of Goethe's reference to Hoffman's 1786 description of a Swiss magistrate, for whom the sounds of various instruments evoked vivid experiences of colours: 'the notes of the cello seemed indigo blue, the violin bright blue, the clarinet yellow, the flute dark red and the trumpet bright red'.<sup>29</sup> But it is unlikely that this was taken to be a case of a new psychological condition at the time. If it were Goethe would surely have used it in support of his view that the eye normally contained a *dormant light*, a view which he had been persuaded to from his study of dreams, afterimages and colour blindness.<sup>30</sup>

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<sup>28</sup> See Marks 1997: 66-67 for more on Castel and conjectured influences, as well as further references to colour organs.

<sup>29</sup> See Krohn 1892: 21.

<sup>30</sup> See Dann 1998: Introduction for a similar point.

### 1.3 *The Emergence of Synaesthesia*<sup>31</sup>

What makes synaesthesia a striking phenomenon is the way that language frequently figures in the cross-modal association. The first clear testimony on record of such a case where vowels and words were reported to produce colours can be traced back to early nineteenth century Germany, more precisely to Erlangen in 1812. We owe the report to an academic, Doctor Sachs.<sup>32</sup> His subject was an albino who experienced colours (he did not experience all the colours of the spectrum nor were those he did experience equally intense) in response not only to vowels and consonants but also to a variety of optical and acoustic stimuli (e.g. names, musical notes, the sounds of instruments and figures), as well as more abstract stimuli (e.g. epochs of history and phases of human life).

In some more detail his responses to vowels, consonants and numerals were the following: *a* evoked vermilion red, *e* evoked rose, *i* evoked white, *o* evoked orange, *u* evoked black, and *ü* evoked white; *c* evoked ash, *d* evoked yellow, *f* evoked opaque white, *h* evoked blue grey, *k* evoked dark green, *m* evoked white, *n* evoked white, *s* evoked navy blue and *w* evoked brown; *1* evoked indistinct white, *2* evoked uncertain, *3* evoked ash, *4* evoked red, *5* evoked yellow, *6* evoked indigo, *7* evoked bluish white, *8* evoked brown, *9* evoked dark green, and *0* evoked a pale uncertain yellow. When numerals were of more than one figure, such as 435 or 768, the group of figures were reported to take on the colour of the last numeral, although tints of the other colours nevertheless remained. The figure 0 did not change the colour of the figures but it did change the general appearance of the combined figures e.g. 10, 11, 100, 110, 111 were all bright but they differed in degree of brightness and clarity. Musical notes were reported to take the same colours as the corresponding letters for the notes. Whereas the subject's colours for the names of cities did not correspond to the colours associated with the individual letters. Likewise for the days of the week: Sunday evoked white, Monday evoked cloudy white, Tuesday evoked an indistinct colour, Wednesday evoked yellow, Thursday evoked green, Friday evoked white, and

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<sup>31</sup> Material in this section is indebted to the earliest reviews of supposed cases of synaesthesia by Suarez de Mendoza 1890, Krohn 1892 and Clavière 1898. Marks 1997 provides a useful chronological summary of the literature on coloured-hearing synaesthesia.

<sup>32</sup> Sachs wrote in Latin. His text was translated by Schlegel. See Krohn 1892: 21.

Saturday evoked a bluish ash colour.

That the associations were reported to be produced by such a variety of stimuli and in such a variety of ways must have made anything more than a description of the associations difficult. Metaphorical associations between objects of distinct sensory modalities are common in language. Was this a strange case of metaphorical association? Or might it have been considered so? It was not until the latter half of the nineteenth century that what was to become known as synaesthesia came to be generally recognised as a genuinely distinct phenomenon having as its explanation an underlying physical or psychological cause. It is a matter of conjecture whether the reality of the condition was regarded with some suspicion in the scientific circles of the first half of the nineteenth century because its manifestations paralleled certain fundamental principles of the poets and artists known as the Decadents or Symbolists (principles which can be traced to the writings of Swedenborg and perhaps also to elements of Goethe's thought). This has been suggested by Clavière.<sup>33</sup>

An abiding theme of Symbolist poetry was the correspondence, both in the sense of likeness and communication, between the senses. Gauthier, a leading figure of the movement, wrote in 1843: 'Mon ouïe s'était prodigieusement développée; j'entendais le bruit des couleurs. Des sons verts, rouges, bleus, jaunes, m'arrivaient par ondes parfaitement distinctes. Un verre renversé, un craquement de fauteuil, un mot prononcé tout bas, vibraient et retentissaient en moi comme des roulements de tonnerre. Chaque objet effleuré rendait une note d'harmonica ou de harpe éolienne.'<sup>34</sup> Further expression of the correspondence between the senses is to be found in the poetry of Baudelaire. In the second verse of 'Correspondance' Baudelaire writes:

Comme de longs échos qui de loin se confondent  
Dans une ténébreuse et profonde unité,  
Vaste comme la nuit et comme la clarté,

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<sup>33</sup> See Clavière 1897: 164.

<sup>34</sup> La Presse, 1843. 'My hearing was prodigiously developed; I heard the sound of colours. The sounds of green, red, blue and yellow reached me like perfectly distinct waves. An upturned glass, a crack of the armchair, a word spoken softly, vibrated and reverberated in me like rolls of thunder. Each object produced a note as that of the harmonica or the eolian harp.'

Les parfums, les couleurs et les sons se répondent.<sup>35</sup>

Gauthier and Baudelaire both belonged to a circle known as the *Club des Haschichins*. It met at Boissard's salon. According to Baudelaire the correspondence between the senses assumed an unaccustomed vividness under the influence of hashish.<sup>36</sup> Synaesthetic-like effects can be drug-induced. Perhaps the poem is an expression of such synaesthetic-like effects. It is not clear whether this intensified any existing synaesthetic tendencies or simply appeared to corroborate existing beliefs about the correspondence between the senses. Perhaps the most celebrated artistic expression of the artificial association of sensory modalities of this period comes from another French poet, Arthur Rimbaud. On the evidence of his *Sonnet des Voyelles* of 1871 it seems unlikely that Rimbaud was unaware of the growing interest of synaesthesia amongst the scientific community, although he admitted two years after the publication of his sonnet that he invented the colour of his vowels. The opening lines of the sonnet run:

A noir, E blanc, I rouge, O bleu, voyelles.  
Je dirai quelque jour vos naissances latentes.<sup>37</sup>

The way that scientific psychology and art confronted each other over synaesthesia may be seen differently. Instead of art delaying the serious study of synaesthesia scientific psychology may have served to deflate artistic pretensions. Dann has argued that synaesthesia has always been attractive to Romantic ideas because synaesthetic responses to stimuli might seem to confirm some of their central tenets, on the one hand, 'the primacy of imagination in human cognition' and, on the other hand, the 'continuity of sensation before it is divided into different types of sensation'. Dann also points out how, to the Romantic, synaesthesia seems to suggest an escape from the 'decline' into a rationalism based upon the evidence of the five senses. In his turn, Dann notes that this use of synaesthesia can be seen as a cultural

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<sup>35</sup> Baudelaire *Les Fleurs du Mal* (1857) dedicated to Gautier. 'Like the long echoes which blend in the distance in a shadowy and profound unity, vast like the night and like the light, the perfumes, the colours and the sounds communicate.'

<sup>36</sup> See Baudelaire 1860: 218.

<sup>37</sup> 'A black, E white, I red, O blue, vowels. I will one day speak of your hidden origins'. See Rimbaud 1873 for commentary.

barometer for the limitations of Romanticism's attempts to reverse the tide of the Enlightenment.<sup>38</sup>

More reports followed of vowels, letters, words and other sounds producing a range of different colours. Cornaz, a Swiss oculist, who in 1848 documented several such cases, described these as cases of 'hyperesthésie' or more precisely 'hyperchromatopsie', his reason being that he took this phenomenon to be caused by a hypersensitivity in his subjects' sense of colours caused by some kind of optical lesion. His seems to be the earliest physiological explanation for synaesthesia.<sup>39</sup> In 1864 Chabalier argued to the contrary: synaesthesia was not pathological in origin, simply a slight oddity. In so doing he was supporting the view presented by Perroud in the previous year.<sup>40</sup> In discussion Chabalier coined the term 'pseudo-chromoesthésie' to refer to the phenomenon. Experiences of colours were not the only associations reported. Vautier reported experiencing a painful toothache on hearing a particular sound.<sup>41</sup> And there were reports in which stimuli other than sounds produced experiences of colours.<sup>42</sup>

One of the more interesting cases of the period involved a pair of twins. In 1873 Nüssbaumer published a detailed account of his experiences and those of his brother. As young children they both experienced colours in response to hearing sounds. One of their childhood games was to use spoons attached to pieces of string to make bells. They would argue about the colours produced. For both brothers vowels produced colours. Various other sounds would also produce colours, for example the notes of the piano, and of other instruments. Nüssbaumer called the phenomenon 'phonopsia'.<sup>43</sup>

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<sup>38</sup> Dann 1998: Introduction.

<sup>39</sup> Cornaz 1848 & 1851. In this view he was followed by Wartman 1849 and by Marcé 1860. The latter believed that hyperesthesia should be classified alongside the phenomenon of colour-blindness.

<sup>40</sup> Perroud 1863, Chabalier 1864. See these and Mayerhausen 1873 for more colour associations. The vowel/colour associations reported by Perroud and Chabalier show some differences but also some similarities. Perroud reported the following: 'a evoked orange yellow, e evoked bluish or pearl grey, i evoked carmine, o evoked canary yellow, u evoked sombre brown and diphthongs produced two distinct colours'. Chabalier reported that 'a evoked black, e evoked grey, i evoked red, o evoked white and u evoked sea-green'.

<sup>41</sup> Vautier 1860.

<sup>42</sup> See Perroud 1863.

<sup>43</sup> Nüssbaumer 1873.

By the 1870s synaesthesia was no longer an unusual phenomenon, which was only studied at the fringes of the new science of psychology. In 1876 Fechner, the founder of psychophysics, used questionnaires as a method of investigating synaesthesia. He described 347 purported cases, including two cases of blind people who only noticed their synaesthetic experiences after they had become blind and one case of a colour-blind person who only experienced the colours he was acquainted with. Perhaps the most extensive early study of synaesthesia was conducted by Bleuler and Lehmann. They also employed the questionnaire method. Their study of 1881 revealed all manner of synaesthetic associations. As well as the standard associations between sounds and different colours (with respect to which they noted a relation between low sounds and dark colours and high sounds and light colours), they found associations between languages and colours, geometrical figures and colours, odours and colours and tastes and colours. Bleuler and Lehmann termed the synaesthetic experiences 'secondary sensations', distinguishing between 'photisms' (the secondary sensations of colour) and 'phonisms' (the secondary sensations of sound).

One of the earliest references in the English-speaking academic community is to be found in Galton's *Inquiries into Human Faculties and their Development* where he summarizes the current knowledge of synaesthesia thus:

As my present object is to subordinate details of the general impression that I wish to convey of the peculiarities of different minds, I will simply remark - First, that the existence of the colour association with sound is fully as remarkable as that of the Number-Form with numbers. Secondly, that the vowel sounds chiefly evoke them. Thirdly, that the seers are invariably most minute in their description of the precise tint and hue of the colours. They are never satisfied, for instance, with saying 'blue', but will take a great deal of trouble to express or to match the particular blue they mean. Fourthly, that no two people agree, or hardly ever do so, as to the colour they associate with the same sound. Lastly that the tendency is very hereditary.<sup>44</sup>

The closest antecedent to the term *coloured hearing*, currently used with reference to the most common form of synaesthesia, was introduced in the *London*

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<sup>44</sup> Galton 1883. The persistence of the connections between numbers and colours was noted by Holden in 1885, who had recorded his daughter's association of colours with letters at regular intervals.

*Medical Record* in an article published in December 1881, bearing the title *Color-Hearing*. This article was also published in the *Medicinisches Neuigkeiten* in Germany and the *Lancet* in Cincinnati.<sup>45</sup>

The terminology seems to have been quickly adopted in the French speaking academic community. Articles by Rochas, Giradeau, Baratoux and Lauret all bear the title *L'audition colorée*.<sup>46</sup> Articles of this period postulated a variety of mechanisms underlying synaesthesia. Commenting on the Nüssbaumer case Nüel suggested that synaesthesia was caused by the proximity of areas of the brain, which subserved hearing and vision, and that 'central nervous irradiations' from the auditory centre affected 'sensory afferent signals' to the visual area.<sup>47</sup> Rochas claimed that in synaesthetes there was a connection between those cortical cells, which processed visual signals and those cortical cells which processed auditory signals. Baratoux claimed that in synaesthetes the chromatic centre of the brain could be excited by signals from sensory organs other than the visual organs. Steinbrügge suggested that the neural connections could be made in one of two ways: either one sensory nerve connected with another sensory nerve and thus connected with a different sensory area or one sensory nerve extended beyond its own sensory centre to a different sensory area.<sup>48</sup>

The first review length treatment of the topic by Suarez de Mendoza, also bearing the title *L'audition colorée*, appeared in 1890. Suarez de Mendoza catalogued the various types of secondary pseudo-sensations, which he also believed were physiological in origin, under the generic term *pseudesthésie physiologique* as follows:

- Pseudo-photesthésie: secondary sensations of colour
- Pseudo-acouesthésie: secondary sensations of sound
- Pseudo-phrésthésie: secondary sensations of smells
- Pseudo-gousesthésie: secondary sensations of tastes
- Pseudo-apsiesesthésie: secondary sensations of touch

<sup>45</sup> Clavière 1897: 161. The term 'Das Farbenhören' was used in Germany.

<sup>46</sup> Rochas 1885, Giradeau 1885, Baratoux 1886 and Lauret 1886.

<sup>47</sup> Nüel 1876. Pedrono 1882 agrees.

<sup>48</sup> Steinbrügge 1887.

He further subdivided each of these by their origins. So, if one considers *pseudo-photesthésie*, it could have its origin as vision, audition, olfaction, gustation or touch. Thus, for instance, Mendoza termed the phenomenon whereby a sound enabled an experience of colour *pseudo-photesthésie d'origine audative*. He also included a class of stimuli of purely psychological origin. This last class included stimuli such as the days of the week and the months of the year. It is not quite clear how these could have been purely psychological. It was surely the names for the days of the week and the months of the year, which were associated with colours and these are not purely psychological. It is possible that such reports involved a different but superficially similar phenomenon to synaesthesia.

The next major study of synaesthesia was undertaken by Flournoy.<sup>49</sup> Flournoy collected together the data on coloured vowels already gathered by Claparède, Fechner and Bleuler and Lehmann, as well as adding data of his own. By way of introduction he commented on existing terminology. He noted that the term 'coloured hearing' was inadequate to capture exactly the varied features of the condition; sometimes visual features had no relevance whatsoever. His conclusion was that 'synaesthesia' was a better term, since it could be qualified to denote the variety of forms of the condition: 'visual synaesthesia', 'auditory synaesthesia' etc. Flournoy's term 'synaesthesia' also had the advantage that it was neutral between psychological and physiological explanations. (Nevertheless he continued to use the more convenient term 'synopsie' for the condition more commonly referred to by the term 'coloured hearing'.)

Flournoy divided the significant components of synaesthesia into two: the inducer and the induced phenomenon. He then observed that the latter could be considered in three ways: by cause, by nature and by intensity. The causes of the induced phenomena were twofold: either sensory or psychological. With respect to the sensory causes he acknowledged Suarez de Mendoza's list of stimuli appropriate to the five sensory modalities, and added stimuli having thermal, muscular and visceral

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<sup>49</sup> Flournoy 1893.

origins. The psychic causes were *ideas*, such as the ideas of days or names. But it is no more obvious that ideas of things can induce experiences independently of language and thus sensory features. As for the natures of the induced phenomena, these could be threefold: photisms, schemes (symbols/diagrams) and personifications. Flournoy explained the difference between the first two types of induced phenomena as corresponding to the difference between content and form. The division was not, however, neat; the induced photisms tended to have formal features and schemes tended to have content. The final class of induced phenomena, concerning personifications, included conceptual associations. Lastly, the intensities of the induced phenomena had a fourfold classification. Some induced phenomena were *objective*. These were projected, localised and vivid, that is to say, they seemed to fit alongside real sensations (although none of his subjects confused these secondary sensations with the primary sensations which enabled them). For some of his subjects the induced phenomena appeared two metres before their eyes, for others they appeared projected onto the object making the sound. At the opposite extreme some induced phenomena were *thought*. These were simply conceptualisations triggered by certain experiences. Letters would give the idea of a corresponding colour. One subject said that he produced the internally vocalised name of a colour. Another subject said that he would pick up a crayon of the appropriate colour in response to the specific letter. In between these two extremes were induced phenomena in which colours appeared to be 'in the subject's head'; they were not projected and were usually less vivid. This type of induced phenomena was the most frequent. He divided these induced phenomena according to whether they were *imagined* or *localised*. Flournoy also distinguished a particular type of induced phenomena, that consisting of negative photisms. His subjects who had negative photisms would only say that a photism was not a certain colour.

Flournoy believed that stimuli to the optical, auditory and olfactory nerves could all produce the same emotional effects. It was his hypothesis that a sensation associated with one sensory modality might induce, via its emotional effects, a

sensation more commonly associated with another sensory modality. But it is the details of his analysis of the data, which occupy the greater part of the book.

In discussing the experiences, which were caused by the letters of the alphabet, Flournoy noted a number of findings. If the specific colours evoked by the vowels were ignored and only their brightness considered, that is to say classifying colours as bright, medium and dark, he found the following correspondences: *i* and *e* were bright; *a* and *o* were medium bright and *u* and *ou* were dark. Flournoy concluded that there was a relation between the vowel sounds and the brightness of the colours. This he called the *loi de clarté*.<sup>50</sup> Flournoy also found that there was some consistency in associations between vowels and colours across subjects: *a* tended to evoke white, black, red or blue; *e* tended to evoke white, grey, yellow or blue; *i* tended to evoke white, yellow or red; *o* tended to evoke yellow, red or black; *u* tended to evoke green, blue, violet or brown and *ou* tended to evoke brown, red or grey. He called the tendency of certain vowels to evoke certain colours the *loi de préférence*. In general, he found red, yellow and white to be the most frequently evoked colours, then green, blue and black and least frequently evoked were violet, grey and brown. Diphthongs were usually either a mixture of the two composite colours or predominantly one of the two composite colours. Consonants were usually dull. Words tended to take the colour of the predominant vowel.

Probably the first experimental work on synaesthesia was conducted by Beaunis and Binet at about the same time. They attempted to ascertain reaction times for coloured hearing. They asked synaesthetes to respond as soon as they experienced a colour in association with a stimulus. The average time was .51 seconds. The average time for the recognition of letters alone was found to be .45 seconds; too short, so they believed, to be a psychological association. Philippe extended the research. He found that the time for letter recognition was greater than the reaction time for experiencing the colour alone; the time until response to letters was .76 seconds; the time until response to colours was .70 seconds.<sup>51</sup>

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<sup>50</sup> Flournoy noted too that colour was a function of the volume and intensity of the sound: the louder the sound the brighter the colour.

<sup>51</sup> Beaunis & Binet 1892 and Philippe 1893.

Synaesthesia was taken up in America along with the new experimental science of psychology. The early volumes of American psychological journals are dotted with papers on synaesthesia. The foremost problem in psychology was that of the study of sensation. The importance with which synaesthesia was now regarded as an aid to that study can be assessed from Krohn's early review article: 'But the pseudo-sensations constitute the subject matter of psychology just as much as those arising from 'bona fide' stimuli. Indeed, much light is thrown upon the problems of psychology by following out this line of study and investigation. Some of the most useful as well as the most interesting psychological material comes to us in the form of pseudo-sensations'.<sup>52</sup> Krohn noted the inextricability of the secondary sensation from the primary sensation, concluding that synaesthesia could best be accounted for by physiological causes.

The pioneer female American psychologist Mary Calkin disagreed about Krohn's explanation of synaesthesia. She believed that it was a much more common phenomenon than had been suggested by the single case studies. She also believed that there was much more variety than was suggested by Flournoy's *loi de clarté*. In accordance with the predominant viewpoint in psychology of the period she argued that the correspondences between colour and sound were the result of learned associations (often a colour being associated with a word before being associated with a letter).<sup>53</sup> Kaiser had already proposed in 1871 that synaesthesia was an artificial association made by the subject when young between a primary stimulus, usually a letter or a word and an imagined colour, in order to aid memory and that in time this association had become spontaneous. This view can also be found in a paper by Stephens, who claimed that letters were coloured because linked by a chain of associations to things that were coloured: letters were associated with words, which were in turn associated with objects which were in turn typically associated with a particular colour.<sup>54</sup>

The last decade of the nineteenth century and the first three decades of the

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<sup>52</sup> Krohn 1892: 20.

<sup>53</sup> See Calkins 1893 and 1895.

<sup>54</sup> Stephens 1882.

twentieth century saw a sustained investigation into synaesthesia. Not only new cases but interesting new forms of synaesthesia were documented. The first case of gustatory and tactile hearing was reported in 1907 by Pierce.<sup>55</sup> The subject in question was a young woman who was anosmic (she lacked a sense of smell) and also suffered from a slight deafness. The sound of particular words and non-linguistic sounds produced experiences similar to those she would have had were she tasting certain substances: the word 'cause' caused a gustatory experience which she normally had when tasting 'hot, soft corn bread'; the word 'distinct' caused a gustatory experience which she normally had when tasting 'preserved pears'. These experiences seemed to her to be intermediate between real sensations and imagined tastes.

In the 1920s Wheeler wrote about and collaborated with Cutsforth on a series of papers.<sup>56</sup> These papers report in great detail the phenomenal character of the form of synaesthesia experienced by the latter, who had lost his sight at the age of eleven, and how synaesthesia relates to a number of other psychological processes: dreaming, learning, meaning, perception, reasoning and concept development. An example of their research involves an experiment designed to investigate how Cutsforth would learn and recognise syllables represented in Braille. The method used by a non-synaesthetic control shows only the use of tactile experience, followed by the internal vocalisation of nonsense syllables (constituted by consonant-vowel-consonant strings). Cutsforth describes his experience as follows:

I paid no attention to the tactual-kinaesthetic elements in the learning or in the perceptions of the letters. As fast as I inspected each syllable the appropriate synaesthetic visual image appeared at my fingertips, the coloring and brightness of the imagery being determined by the letter. When I then found myself vocalising the syllable, the syllable itself tended to take on the colour of the initial letter. As my attention shifted from the procedure of inspecting the letters, tactual-kinaesthetic fashion, the visual imagery which at all times remained dominant in consciousness shifted to the center of my field of vision. Throughout, the tactual-motor processes were dim, vague, indescribable experiences of which I know nothing except in terms of their visual associates.<sup>57</sup>

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<sup>55</sup> Pierce 1907: 341 observed that synaesthesia did not yield any facts of profound import for psychology, only 'the myriad diversities of human nature'.

<sup>56</sup> Wheeler 1920, Wheeler & Cutsforth 1920, 1921a, 1921b, 1922a, 1922b, 1924, 1925.

<sup>57</sup> Wheeler & Cutsforth 1921a: 453-4.

The letters came to be identified by the colours and shapes they took rather than any tactile character. Wheeler claimed that there was a sameness of function between the blind non-synaesthete's experiences and Cutsforth's, but a difference in mental content. (Cutsforth's method of learning was not actually quite as efficient as that used by the non-synaesthete control because the nonsense syllables produced colours which did not relate to one another but 'floated free'.) It was because the synaesthetic experiences of colour seemed to function for Cutsforth in the same way as tactile experiences functioned for the non-synaesthetic blind person that Wheeler and Cutsforth claimed that in synaesthesia generally the secondary experiences represent an objective feature just as much as the primary experiences. When for example a person has coloured hearing a certain blue colour means a flute tone just as much as the auditory quality itself; the colour has come to function as an integral element in the process of perceiving.<sup>58</sup>

Synaesthesia was particularly amenable to the introspective methodology of the new experimental psychology, which attempted to determine the structure of the experience by analysing it into its basic elements. With the rise of behaviourism as the dominant methodology in psychology, there was a corresponding diminution in the study of synaesthesia. Marks notes that in the fifty years between 1881 and 1921 there were 74 publications on visual-auditory synaesthesia, whereas in the forty-two years between 1932 and 1974 there were just 16 publications.<sup>59</sup> Coincidental with the cognitive revolution in psychology, and the current interest in conscious phenomena, there has been a resurgence of interest in synaesthesia.

#### 1.4 *Synaesthesia: matching and translation*

There is currently some consensus about what the object of research is in synaesthesia studies. The most recent survey of synaesthesia includes in its introduction the remark: 'We, along with others (Vernon 1930; Marks 1975; Cytowic 1989, 1993; Motluk 1994), define synaesthesia as occurring when stimulation of one

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<sup>58</sup> See Wheeler & Cutsforth 1922a: 369. This is discussed further in section 3.4.

<sup>59</sup> Marks 1975 reprinted 1997.

sensory modality automatically triggers a perception in a second modality, in the absence of any direct stimulation to this second modality'.<sup>60</sup> The example Baron-Cohen and Harrison give is the standard one in which 'a sound might automatically and instantly trigger the perception of vivid colour; or vice versa'.

I shall here adopt this working definition with one modification. It might be questioned to what extent the stimulation of one sensory modality produces a *perception* in a second sensory modality. If such were the case it seems to follow that synaesthesia is a perceptual process. This is problematic for the straightforward reason that we tend to think of perceptual processes as relating subjects to states of affairs, which exist independently of their acts of perception. Synaesthesia does not do that. So how should the definition be modified? Perhaps we should say that the stimulation of one sensory modality produces an experience in a second modality. But does this then mean that the one stimulus produces one or two experiences? Does a single sound produce an experience of the sound and an additional experience of a colour? How are experiences to be individuated? In order to mitigate any worries along those lines I shall talk of synaesthesia as occurring when the stimulation of one sensory modality automatically triggers an *additional phenomenal (or qualitative) character of experience* that would normally be triggered by the stimulation of a second sensory modality. Exactly what the phenomenal character of experience is, and specifically the phenomenal character of synaesthetic experience, will be further considered in chapter three.

Despite the consensus amongst researchers over the object of research there remains some disagreement about how to explain the phenomenon of synaesthesia. The present section focuses on one central disagreement: is synaesthesia different in kind from normal psychological processes or is it different only in degree from them?

Marks has endorsed the latter possibility. He claims that synaesthesia is: 'the translation of attributes of sensation from one sensory domain to another'.<sup>61</sup>

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<sup>60</sup> Baron-Cohen & Harrison, 1997: 3.

<sup>61</sup> Marks 1997: 49. See also Marks 1982a, 1982b & 1987. Marks also cites drug-induced synaesthesia and phonetic symbolism as corroboration of the link between normal matching and unusual translations. But there is no reason for this evidence to support any particular explanation of synaesthesia.

According to Marks, synaesthesia most commonly occurs in the connections between 'color and thermal sensations: yellow, orange and red are frequently perceived and described as 'warm' colours, blue and green as 'cool' colors'. The inference is presumably that the description of colours in terms more commonly used of the properties perceived via another sensory modality presupposes some form of translation between different types of sensation. 'Much more dramatic examples of synaesthesia' are those 'associations reported in the literature on colored hearing and colored taste'. Rather than dismiss the seemingly idiosyncratic cases of synaesthesia recorded in the psychological literature as having no or little bearing on the operations of the normal mind Marks sets out to explain how these often have more regularity than they might at first sight appear to. Indeed they reflect 'important cognitive properties that in several respects are common to normal people as well as synaesthetes'.<sup>62</sup> Following Marks this theory of synaesthesia can be called the theory of *Cross-Modal Translations of Sensory Dimensions* (hereafter CMTSD).

Reservations will centre on whether the notion of translation obscures an important difference between normal cross-modal associations and synaesthetic associations. Some orientation of the discussion is required. Firstly, the idea of the parallels between sensory dimensions in non-synaesthetes and synaesthetes will be discussed. Secondly, this will be pictured in terms of parallels between dimensions in quality spaces. Thirdly, a construal of the psychological process relating sensory dimensions in terms of a matching process will be given. Fourthly, a construal of the psychological process relating sensory dimensions in terms of a translational process will be given. And finally it will be argued that there is no clear continuity between the two processes which is what is demanded if synaesthetic processes are supposed to be different not in kind but only in degree from normal processes.

Marks starts by considering coloured hearing and in particular that form of coloured hearing in which vowel sounds produce experiences of colours. The question he asks is: 'is there an intrinsic relation between sound (vowel quality) and associated visual sensations (colors)?'<sup>63</sup> His claim is that there is and that it is 'as

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<sup>62</sup> Marks 1997: 50.

<sup>63</sup> Marks 1997: 51.

intimate as is the well-studied relation between brightness and loudness in non-synaesthetic subjects'. In non-synaesthetic subjects it has long been known that when asked to match brightness of lights and loudness of sounds subjects align increasing luminances with increasing loudness in a systematic way. It is Marks' proposal that synaesthesia provides the mechanism for cross-modal matching of this type as well as the more unusual associations reported in the psychological literature.

For many synaesthetes also music displayed a correlation between the dimensions of loudness and brightness: the louder the musical sound so the brighter the colour experienced. But synaesthetes' experience of music also manifested a correlation between sound frequency (i.e. pitch) and colour brightness. The second lesson Marks takes from a reading of the literature on synaesthesia is the correlation between pitch and brightness: the higher the pitch of the stimulus so the brighter the colour experienced. According to Marks this is not just a correlation between 'individual sensations' but it shows 'an association between dimensions of auditory and visual experiences'.<sup>64</sup> This would be consistent with what many non-synaesthetes say about high-pitched sounds, namely that they are brighter than low-pitched sounds.

To try to clarify this latter correlation in synaesthesia Marks focused on the much-researched association between vowel sounds and experiences of colours.<sup>65</sup> Marks observed a consistency between the pitch of vowel sounds (specifically the second formants of the vowel sounds, that is to say the acuteness of vowel sounds) and colours: *a* evoked red and blue; *e* and *i* evoked yellow or white; *o* evoked red or black; *u* evoked blue, brown or black. In order to extract more information from the data provided by previous research he converted it into scores on three bipolar dimensions: black-white, red-green and blue-yellow. These are the usual dimensions for the *Opponent Process* theory of colour vision, but they can also be used to describe the co-ordinates of the colour solid. To take the black-white dimension first, Marks found that *i* and *e* (the vowels of highest pitch) corresponded to the position of greatest brightness; *o* and *u* (the vowels of lowest pitch) corresponded to the position of least brightness and *a* was intermediate between them. In fact the relationship

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<sup>64</sup> Marks 1997: 57. This had already been noted by Riggs and Karwoski.

<sup>65</sup> Marks 1975: 51-66.

between pitch and the brightness of the induced colour was almost linear.<sup>66</sup>

In addition to the correlation between pitch and brightness, which reflects the acuteness of vowel sounds, Marks further claimed that the position on the red-green dimension is a function of the relative frequencies of the second and first formants of the vowel sounds. This reflected the compactness of vowel sounds such that compact vowels (*a* and *o*), having a low second to first formant frequency ratio, were more red, and the diffuse vowels (*i* and *e*) having a high second to first formant frequency ratio were more green. He could find nothing to explain the blue-yellow dimension.

Furthermore Marks found in the psychological literature correlations between two other dimensions. He found that the pitch of the auditory stimulus correlated with the size of the photism (the induced visual sensation): the lower the pitch of the sound so the bigger the photism. And he found that the loudness of the auditory stimulus correlated with the size of photism: the louder the sound so the bigger the photism.

It appeared from these correlations that two auditory dimensions, pitch and loudness, might map onto two visual dimensions, brightness and size in contrasting ways: brightness increases with loudness and with pitch, and size of induced visual sensation increases with loudness but diminishes with pitch. In order to explain this Marks claimed that the auditory dimensions needed to be understood slightly differently. Marks postulated a dimension of auditory brightness, which he understood in terms of the density of the perceived sound. Position along this dimension (the density of perceived sound) increases with the loudness and with the pitch of a sound. A different dimension of auditory volume would increase with loudness but decrease with pitch. In this way auditory and visual dimensions would coincide. According to Marks then what an investigation of synaesthesia shows is that there exist two general cross-modal dimensions: one including auditory brightness and visual brightness, and another including auditory volume and size of induced visual sensation. Synaesthesia on this view involves the association of a stimulus experienced via one sensory modality with the character of an experience usually associated with another sensory modality according to the positions they share on a common sensory dimension. This

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<sup>66</sup> This might be seen as an endorsement of Flournoy's *loi de clarté*.

is what Marks means by a translation of sensory dimensions.

In order to evaluate the CMTSD theory properly one needs to appreciate what is supposed to be held in common between the sensory dimensions of different sensory modalities. In order to do this it is helpful to advert to the idea of a quality space. A quality space does not actually inhabit physical space as a normal solid might. It can nevertheless be thought of as a space if we think of a space as something which can be characterised by a multidimensional order and if we think of an order as something which can be characterised by an ordering relation. An order may be taken to consist of a set and relations that order that set. A line may be characterised by a one-dimensional order consisting of a point of origin, a set of positions and a greater-than relation which orders those positions in relation to the point of origin. Multidimensional space needs to add a direction from the point of origin and a further ordering relation with respect to that direction. How do we determine the order which characterises the dimensions of a quality space? Suppose we are presented with two tokens, *x* and *y*, of sensory stimuli types, *X* and *Y*. We fail to discriminate them. We are presented with another pair of tokens, *y* and *z*, of sensory stimuli types, *Y* and *Z*. We fail to discriminate them. Then we are presented with a third pair tokens, *x* and *z*, of sensory stimuli types, *X* and *Z*. We succeed in telling the sensory stimuli apart. An order can be generated out of the way we are able to discriminate the sensory stimuli. There are several way of doing this. One way is to use the partial and total overlaps between classes of indiscriminable stimuli. Tokens of *X* and *Y* might be in one class. Tokens of *Y* and *Z* might be in another class. Since tokens of *X* and *Z* are in different classes by Leibniz law a token of *X* cannot be of the same type as a token of *Y* since tokens of *X* and tokens of *Y* have different relations to tokens of *Z*. Nor can a token of *Y* be of the same type as a token of *Z* since tokens of *Y* and tokens of *Z* have different relations to tokens of *X*. This leaves tokens of *Y* belonging to a distinct class. The chain of overlapping classes can be used to order the quality space.<sup>67</sup>

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<sup>67</sup> The idea derives from Carnap 1967. This is actually a simplification, see Goodman 1951 and Clark 1993. New dimensions are postulated in order to avoid placing discriminable characters of experience between indiscriminable characters of experience. The definition of dimensionality is recursive. The dimension is  $n+1$  if there are indiscriminable characters of experience in the  $n$ th

The quality space is derived from psychological processes, from the discriminations we are able to make with respect to classes of stimuli. It is for this reason that the quality space can be contrasted with a physical space. However, the quality space has been produced with the aid of physical stimuli. So we might also think of a correlative space. The colour solid is a representation of the space, which correlates with the quality space generated by visual stimuli. The colour solid may be represented by a physical solid. The dimensions of the colour solid are hue, brightness and saturation. In order to imagine the colour solid one might imagine a sphere. The vertical axis would represent the brightness of a colour; at points along the vertical axis can be found the non-chromatic greys. In the top hemisphere are the lighter shades of colour (at the top pole is white); in the bottom hemisphere are the darker shades of colour (at the bottom pole is black). The horizontal planes map out the saturation of shades of colour at particular brightness values. At points close to the vertical axis are to be found colours of reduced saturation, at points distant from the vertical axis are to be found colours of increased saturation. The circumference of the central horizontal plane is marked out by the saturated primary colours: red, green, yellow and blue. Around the sphere will be saturated primary colours of greater or lesser brightness. Throughout the colour solid colours shade into each other. For example, starting from one point saturated green shades into saturated yellow in one direction, into saturated blue in another direction, into saturated dark green in another direction, into saturated light green in another direction and into unsaturated green in another direction. Pairs of shades of colours that are equally distant are equally similar. Although the colour solid can be represented using a solid in physical space, it must be remembered that it is generated in the first place by the discriminations that we can make of sets of visual stimuli. It is for this reason that the saturated hues form a circle.

Something similar can be said for the quality space generated by auditory stimuli, although it is not as easy to determine its exact number of dimensions. What

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dimension which are inconsistent with there being  $n$  dimensions. Failures in constructing  $n$ th dimensional series forces an  $n+1$  dimensional structure. Suppose all patches of a given brightness were collected together, an attempt to arrange them would require a two-dimensional arrangement that is roughly circular.

we do know is that two of the dimensions constitutive of the quality space can be generated by discriminations of pitch and loudness.

Now according to Marks different sensory modalities have common dimensions. Recalling that the dimensions of quality spaces are generated by the discriminations we can make, the thought seems to be that two different quality spaces - those generated by visual stimuli and those generated by auditory stimuli - coincide with respect to particular dimensions, brightness and volume, because the ordering relations which constitute those dimensions coincide. According to the CMTSD theory it is this coincidence which normally allows synaesthetes and non-synaesthetes alike to correlate orderings of visual stimuli and orderings of auditory stimuli. Moreover, it is this coincidence which is supposed to show that the synaesthetic correlations of sounds and colours are simply a heightened expression of this normal ability to correlate orderings of visual stimuli and orderings of auditory stimuli.

Let us first consider a case in which both synaesthetes and non-synaesthetes are asked to relate visual and auditory stimuli in virtue of their brightness. Consider a loud auditory stimulus and a soft auditory stimulus on the one hand and a bright visual stimulus and a dark visual stimulus on the other hand. Let us suppose that subjects accomplish the task according to the prediction, that they correlate orderings of visual stimuli and orderings of auditory stimuli.<sup>68</sup> The question now arises as to how the task was accomplished. Marks seems to claim that it is by a process of translation. Is this an accurate description for the case outlined above?

At first sight the task seems better described as a matching task. Matching tasks are accomplished when the subject is able to abstract some feature in common between two given elements. Matching typically requires that we abstract from the totality of features of the items to be matched in order to identify particular features of the items. We match two colour samples by ignoring their particular shapes and by focusing on the qualitative identity of their colours. Similarly, we might match the shape of something when seen and when touched. Here we match the shape perceived

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<sup>68</sup> See Stephens and Marks 1965 and Marks & Stephens 1966.

visually and perceived by touch by ignoring the features that mark out the distinctive sensory modalities (colours in the one case and textures in the other case). When we are asked to match the elements belonging to two sets of elements, visual stimuli and auditory stimuli, it seems that this too is accomplished in virtue of some feature they have in common. In this case it seems reasonable to suppose that the feature they have in common is a dimension along which can be ordered perceived stimuli in a related way. It is this order which is abstracted from other features peculiar to the distinctive sensory modalities and ordered positions on that dimension matched between the sensory modalities.

Therefore it is not that one type of experience, a visual experience, is simply associated with another type of experience, an auditory experience, in synaesthesia. They are associated in virtue of occupying related positions along dimensions of their respective quality spaces which can thus be regarded as a common dimension. Matches between experiences of sound and experiences of colour are possible because they also have relational properties in common (how they are ordered along dimensions of quality spaces). One can think again of the visual quality space and the auditory quality space. Matches will depend on where the experience of sound and the experience of colour occur along the dimensions determined by pitch discrimination and brightness discrimination respectively, and these will be determined by ordering relations: sounds which are discriminated as being of higher pitch will be matched with colours which are experienced as being brighter than other colours; sounds which are discriminated as being of lower pitch will be matched with colours which are experienced as being less bright than other colours. Although quality spaces are individuated by their distinctive dimensions (the experience of hue individuates the visual quality space), there are common dimensions of our quality spaces. Experiences of colours and experiences of sounds are usually treated as completely different kinds of experiences by philosophers. It would be of some interest to philosophy if they have significant features in common.

So the task seems better described as one of matching. Marks sometimes

acknowledges this.<sup>69</sup> The question is whether this matching task can also be construed as one of translation. A typical case of translation occurs when one has two languages. Here one also has two sets of stimuli which have to be related. They may be sentences or individual terms. It is easier to deal with individual terms. If the case of language translation and the case of matching features of different quality spaces are to be analogous the items of the two sets of terms have to be related in virtue of a feature common to them. In the case of language it is clearly not a dimension common to two quality spaces. But one might argue that there is something in common to two languages in virtue of which one translates between them, namely the world. In some sense, the process which seems to take place in the matching experiment is like that which occurs when a language user translates tokens of one language into tokens of a second language. Translation between different languages is possible because there is a framework in common between the languages. That framework constitutes the meaning of the individual elements of language. An English word 'dog' can be translated into a French word 'chien' or an Italian word 'cane' because there is something in common for the English, the French and Italians, namely dogs. When the terms are translated it seems reasonable to say that they are matched for meaning.

However it does not make as much sense to construe other matching experiments in terms of translation. When colours samples are matched we do not think of this also as a process of translation. When shapes are matched we do not think of this also as a process of translation. We might think of the matching of auditory and visual stimuli also as one of translation because it is an order (i.e. a relation other than each token colour or sound) which is matched.

So the CMTSD seems to be vindicated. If the preceding is correct then it would indeed appear that synaesthesia tells us something about normal perceptual processes, but only in the way that a careful study of those normal perceptual

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<sup>69</sup> Baron-Cohen & Harrison 1997: 117-8 actually call Marks' theory the cross-modal matching theory. One of their main criticisms is that Marks does not show whether the synaesthetic associations involve a culturally inherited metaphor or whether there is an underlying physiological explanation. I think, in contrast to Baron-Cohen and Harrison, that translation *is* a way in which one might initially think of the process underlying synaesthesia. In agreement with them though I think that the task non-synaesthetes accomplish is better thought of as one of matching.

processes might inform us. But is the process, which only synaesthetes seem to perform, really the same type of process as that performed by non-synaesthetes and synaesthetes alike? It would be if there were a continuity between the activities which would allow them to be classed as tokens of the same type of activity. But there are difficulties with the view because there are reasons to doubt the continuity.

The translational process, which is apparent in the experiment involving visual and auditory stimuli, is only apparent because the experiment involves firstly a matching process. In other words both synaesthetic and non-synaesthetic subjects appear to translate auditory and visual stimuli because they first match orderings on two sensory dimensions, visual brightness and auditory loudness, which can then be superimposed one onto the other. Even if the associations between auditory and visual stimuli turn out to parallel in some respects those made by non-synaesthetes it has not yet been shown that this is accomplished in virtue of a matching process. A matching process might be doubtful in synaesthesia because matching requires that the properties to be matched are both present at the start. They are accompanied by a number of other properties from which they are then abstracted. This does not happen in synaesthesia.

If synaesthesia employs a translational process then it seems to be a direct translation. Sounds which are discriminated as being of higher pitch will be translated into experiences of bright colours; sounds which are discriminated as being of lower pitch will be translated into experiences of less bright colours. Perhaps this involves an unconscious matching process? If it does is it still a type of process different in kind rather than different in degree from that which occurs in non-synaesthetes. Why is it not just different in degree because different in the degree of conscious processing? At this point it can just be reiterated that it does not involve a matching process because there are no stimuli to be matched only to be translated. The response might then be that, although there is no matching process at present, it was required to set up the translational process in the first place. In this respect the translational processes of synaesthesia might be like that of language. Originally we match words from two languages, we match the word 'dog' in English with the words 'chien' in French and

'cane' in Italian by distinguishing them from a set of other words, and, in time, we come to translate one term into another without having to match them consciously (although in a sense we do match them because we distinguish them from other words we could have used). To begin with an English speaker would not be able to translate his own language into another one but in time she might match different terms and then automatically translate them into the corresponding terms of another language. To begin with synaesthetes might match sounds and colours. In time they might simply translate the sounds they hear into colours.

The trouble is that there is no evidence for the development of such translational processes via earlier matching processes. But there is another more pressing difficulty for the matching/translation theory. Even if the experience of a sound were to be translated into an experience of a colour of a certain brightness this is but one dimension of the experience. If one considers the visual quality space all that has been discussed is its vertical dimension. It is not clear from anything Marks says where an experience of colour should be placed with respect to the vertical. Marks does not specify the rule which maps the translation from the experience of a sound to the experience of a colour any finer than from one brightness value to another brightness value. In so far as he fails to do this a sound of a certain brightness could be translated in a number of different ways.

The difference between the normal process described and the unusual process of synaesthesia lies in the fact that whereas the task non-synaesthetes perform is clearly a matching task accomplished by abstracting a common sensory dimension which might, at a stretch, then be construed as a process of translation in synaesthetes (though not in non-synaesthetes), the process underlying synaesthesia may be one of translation but it cannot be fully accounted for in terms of matching. The process would not be one of exact matching but one of relative matching. The brightness of colour p might be greater than the brightness of colour q and the brightness of sound x might be greater than the brightness of sound y, so the brightness of colour p might be more like sound x than sound y and the brightness of colour q might be more like sound y than to sound x. But there would have to be other distinctive properties of

the respective quality spaces such that these approximate matchings could be made. In other words, a sound could only be matched with a colour in virtue of the properties they do not share as well as the relations they do share. The difficulty with ascertaining the exactness of a match between a sound and a colour lies in the fact that whereas two colour patches can be indiscriminable in every respect and thus matched, any sound and any colour will be discriminable in virtue of other properties they fail to share and so can never be properly matched.<sup>70</sup>

There is a way of making this distinction more vivid. It is the way that is often used to individuate synaesthesia in the first place. Whereas the matching process accomplished by both non-synaesthetes and synaesthetes is abstractive, it abstracts from what is distinctive of sensory modalities, synaesthesia is an additive process, it adds what is distinctive of a second sensory modality (its distinctive phenomenal character). It is this difference which will make philosophical issues surrounding synaesthesia significantly different from those issues surrounding the cross-modal associations that have occupied philosophers so much.<sup>71</sup>

There is another view, which claims that synaesthesia involves processes different not in kind but in degree from normal processes. Grossenbacher has suggested that synaesthetes might have abnormally strong feedback activity between multi-modal systems and sensory systems.<sup>72</sup> Normally sensory information feeds forward from single sensory areas to multisensory areas. In multisensory areas information, for example, from the visual system may be related to (matched with) information from the tactile system (when we touch what we see) or may be related to (matched with) information from the auditory system (when we hear what we see). Vision is central to the way we understand the world. It is plausible to think that other

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<sup>70</sup> This result is a reflection of the fact that Marks could only correlate some dimensions of quality spaces. There was little for the colour hues to be correlated with. But if he were to do this in the way he did this for brightness then there would be no matches because there would be no relevant distinctions to abstract from.

<sup>71</sup> I am thinking in particular of the cross-modal associations involved in the perception of shape. One might think of the psychological process of matching as a central cognitive process carried out on two sensory inputs. Translation of two tokens of language would also seem to be a central process. At least if this is not a native language. A different view of synaesthesia would be that it is a transformational procedure at the level of input systems. This will be considered further in chapter two.

<sup>72</sup> Grossenbacher 1997.

modes of perception deliver information, which might then be related to stored visual information. When we hear something we sometimes imagine what it might look like. When we smell something we sometimes imagine what it might look like. When we touch something we sometimes imagine what it might look like. These associations might prepare us for what we may see, that is to say, they might feedback into the primary visual areas. According to Grossenbacher synaesthesia is a particular manifestation of feedforward-feedback mechanisms: synaesthetes may have more feedback connections to the primary sensory areas or the primary sensory areas may be particularly sensitive to the feedback signals received, leading to feedforward of signals from the primary sensory area. So feedback from the multisensory area which relates visual information and auditory information may during hearing produce experiences in the visual system in the absence of any direct stimulation to the visual system.

There is some support for the view. Some of the cross-modal associations we normally make are more common than others; the frequencies of different kinds of synaesthetic associations to some degree mirror those frequencies. Auditory stimuli commonly enable visual images of what might be causing those auditory stimuli. Coloured hearing synaesthesia is the most common form of synaesthesia. Less common types of synaesthesia include those for which there is normally less multi-modal processing. We do not commonly draw inferences about the sound of things from the way they smell or taste. Perhaps relatedly there are no reports of synaesthetic pairings in which the perceptual modality is gustation or olfaction and the secondary experience is a sound experience.

However there are a number of difficulties for this view. Firstly, there are forms of synaesthesia, which do not seem to correspond to normal cross-modal associations: taste enables secondary tactile experiences and colours are associated with pains. Secondly, the kind of multi-modal associations suggested above are of a certain kind. For example, sounds of particular items such as cars might be imagined to belong to a concrete item having a particular visual appearance; the sound of an unseen car might make one think of the look of that car. But most forms of

synaesthesia involve other kinds of stimuli e.g. letters or music associated with secondary experiences of quite a different sort: they are not of concrete items having a particular visual appearance, but colour experiences. If we hear a voice we might imagine a face but we do not imagine a colour.

This is related to a third difficulty: the nature and purpose of the supposed feedforward-feedback mechanism. These feedback processes are supposed to help in integrating information from different sensory modalities. Presumably the idea is that the sound of a car prepares one for the look of the car when it comes round the corner. But such a mechanism, if controlled by an auditory stimulus which has been perceived as being the sound of a car, then would surely either prepare the visual system generally for a visual stimulus or prepare the central cognitive system for a specific type of visual stimulus (e.g. the kind of stimulus one gets when one sees a car) or both. There is little reason to think that our hearing a car should prepare us for having particular colour experiences which is what is required for an explanation of synaesthesia. Moreover if synaesthesia were caused by a feedforward-feedback mechanism, which prepares the subject generally for a visual experience, one might expect the associations to be variable. According to most of the research the associations are highly reliable.

It may be that the feedforward-feedback mechanism is of a different type to the one described above. It might be based on the observation of feedback mechanisms in the brain generally. Grossenbacher does suggest this in places. Memory images are thought to be generated by feedback mechanisms. But they are quite different from colour experiences. If colour experiences could be enabled by feedback processes this would go against the prevalent view that colour experiences are generated as the encapsulated output of dedicated neural areas. If this is the view Grossenbacher intends then it seems to be closer in spirit to other explanations of synaesthesia, which see in it a process different in kind rather than in degree from normal processes. Such a view will be further discussed in chapter two. Evidence for a more direct route will be outlined in the next section.

It might be argued that synaesthetic sensations are had by everyone, only they

are not conscious to everyone. Would this not make the experiences synaesthetes enjoy different not in kind but in degree from those other people enjoy? Such a view might have some features in common with some theories of higher-order thought models of consciousness. Rosenthal, for instance, argues that sensations can be had which are not conscious.<sup>73</sup> In the case of synaesthesia, synaesthetic sensations would be had by all, but would only be conscious to synaesthetes. (It is a well-attested fact that we are informationally sensitive to stimuli that we are not ordinarily conscious of).<sup>74</sup> If we all had synaesthetic experiences then what would make some people (synaesthetes) conscious of those experiences and others not conscious of them? On the higher-order thought model it would be another thought. It is true that synaesthetes are able to reduce or ignore their experiences by attending to other things, but there is no suggestion that they can be conscious of such experiences because of similar processes. Presumably neural mechanisms would realise these higher-order thoughts. But this would then make consciousness-making processes local and diverse.<sup>75</sup>

This does not mean that synaesthesia may not have implications for our understanding of the specific mechanisms of consciousness. Synaesthesia has been cited in support of a general explanation of consciousness-making. O'Brien & Opie state, concerning the alleged executive or central consciousness-making system: 'its role [...] is to combine a number of distinct contents hailing from different sense modalities into a single work which it then broadcasts polyphonically'.<sup>76</sup> According to them a key feature of this 'single-track consciousness' model is that it is necessary that the representational content of the broadcast be coherent, i.e. if there were such a

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<sup>73</sup> Rosenthal 1991.

<sup>74</sup> See Flanagan 1992 for examples.

<sup>75</sup> This is supported by the evidence of modified Stroop tests. Stroop tests use colour words which are displayed in different colours in order to test for interference in processing. Mattingley and Rich have recently shown that synaesthetes perform worse than non-synaesthetes on tests when the words are printed in incongruent colours (i.e. colours which conflict with the colours generated by the sound of the words). But this only happens when the task is such that the cognitive processing is available for conscious report. When the level of processing of both semantic and colour information is not available for conscious report synaesthetes and non-synaesthetes performed equally well. This suggests that synaesthesia is an automatic process. It also suggests that the synaesthetic experience of colours is at a post-lexical stage.

<sup>76</sup> O'Brien & Opie 1999: 391.

mechanism an essential property of it would be to prevent incoherent conjunctions. Since incoherent conjunctions are not prevented there can be no such mechanism. In support of their view they cite synaesthesia as an actual instance of an inter-modal incoherent representation and therefore as a counterexample to the single-track model of consciousness. The example comes from Cytowic and is the case of MW who undergoes the tactile experience of shapes on tasting things.<sup>77</sup> O'Brien & Opie claim: 'What is important for our purposes is that there is no seen object corresponding to the felt object that Michael describes, and hence no accord between the visual and tactile modalities. Thus synesthetes exhibit a certain amount of inter-modal incoherence - a breakdown in the normal pattern of connections between the parts of experience.' O'Brien & Opie agree that separate representations are realised by different cognitive modules. Their target is primarily the existence of a central executive, which assimilates or coheres the diverse representations which are the outputs of parallel and distributed modular processes. This is different from the previous idea because what distinguishes synaesthetes is that they have 'a breakdown in the normal pattern of connections between the parts of experience'.<sup>78</sup> Previously there was supposed to be a difference in consciousness-making mechanism, not what provided information to whatever mechanism makes that information conscious.

### 1.5 *Synaesthesia: a distinct psychological process*

Richard Cytowic's book *The Man who Tasted Shapes* has probably been the cause of much of the current popular interest in synaesthesia. He has also supplied a more technical treatment in *Synaesthesia: A Union of the Senses*. These provide a number of self-reports by synaesthetes, which will be of use in later chapters. Although his explanation of synaesthesia is challenged by many working in the area he has focused attention on the task of determining a set of distinctive features of synaesthesia. What Cytowic takes to be some of those features are given in the following passage...

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<sup>77</sup> Cytowic 1994: 65.

<sup>78</sup> O'Brien & Opie 1999: 393.

Synesthesia is an involuntary joining in which the real information of one sense is accompanied by a perception in another sense. In addition to being involuntary, this additional perception is regarded by the synaesthete as real, often outside the body, instead of imagined in the mind's eye. It also has some other interesting features that clearly separate it from artistic fancy or purple prose. Its reality and vividness are what make synesthesia so interesting in its violation of conventional perception. Synesthesia is also fascinating because logically it should not be a product of the human brain, where the evolutionary trend has been for increasing separation of function anatomically.<sup>79</sup>

Cytowic argues that, in order to avoid confusion with superficially similar but otherwise distinct phenomena, diagnostic features for synaesthesia are required.<sup>80</sup> He considers five.

Firstly, synaesthetic experiences are involuntarily elicited by a stimulus: 'it is a passive experience', 'it cannot be conjured up or dismissed at will', although 'circumstances of attention and distraction may make the experience seem more or less vivid'. The contents of synaesthetic experiences are usually identified without difficulty. A synaesthete has no difficulty identifying whether the colour a sound produces is red or green. This feature of synaesthesia has been generally endorsed.

Secondly, the contents of synaesthetic experiences are projected. They are 'perceived externally in peri-personal space, the limb-axis space immediately surrounding the body, never at a distance as in the spatial teloreception of vision or audition'. One of Cytowic's subjects (DS), a college teacher, on hearing music, also 'sees objects' - falling gold balls, shooting lines, metallic waves like oscilloscope tracings - that float on a 'screen' six inches from her nose. Her favorite music 'makes the lines move upward'. Although many synaesthetes do have such experiences many do not experience projected colours, but experience colours as if they were 'in the head'.<sup>81</sup> So it is not obvious that 'projectibility' should be used as a diagnostic criterion.

Thirdly, synaesthetic percepts are 'durable' and 'generic', never sporadic and never elaborate. By the term 'durable' Cytowic means that the cross-sensory associations do not change over time. This has been shown many times by test-retest

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<sup>79</sup> Cytowic 1989: 1.

<sup>80</sup> Cytowic 1989: 64-65, 1993: 65-66 and 1995.

<sup>81</sup> See Baron-Cohen *et al.* 1993.

sessions given years apart without warning. By the term 'generic' Cytowic means 'unelaborated'; while non-synaesthetes might imagine a pastoral landscape while listening to a piece of music what synesthetes experience is simple: 'they see blobs, lines, spirals, and lattice shapes; feel smooth or rough textures; taste agreeable or disagreeable tastes such as salty, sweet, or metallic'. These characteristics of synaesthesia have also been generally endorsed. Perceptual processing seems to involve a number of levels and synaesthetic experiences do not appear to range over all these levels: they occur at the early levels of perceptual processing.

Fourthly, synaesthetic experiences are memorable. Cytowic claims that synesthetes have excellent figurative memory. Many of their anecdotes are about how the 'extra bits' help them to remember telephone numbers, appointments, and the like. It is not clear that this is really a distinguishing characteristic. All sorts of experiences can be memorable. But there is another problem as Cytowic admits. What is memorable is the synaesthetic experience. So the synaesthetic experience has to be related to the original stimulus in order to act as a memory aid. It is not clear that synaesthetes are able to do this any better than non-synaesthetes who use other mnemonic aids. One synaesthete reports 'She had a green name - I forget, it was either Ethel or Vivian'. In this example, it is the synesthetic greenness and not the semantic label that is recalled. In other words, if Ethel is a green blob, the next time you see her you don't say, 'it's Ethel' you say, 'It's the green blob: therefore, it is Ethel.' It is not clear how synaesthesia increases memory. Although the original stimulus produces an additional phenomenal character of experience this additional phenomenal character experience presumably still has to be linked by a memory process to the original stimulus. There is no spontaneous generation of the experience of the original stimulus by the induced colour in the way that there is a spontaneous generation of the induced colour by the primary stimulus.

Finally synaesthesia, according to Cytowic, involves the emotions. The experience is 'accompanied by a sense of certitude (the 'this is it' feeling) and a conviction that what synesthetes perceive is real and valid. The relation between synaesthesia and emotion features rarely, if at all, in other theories of synaesthesia.

The reason for this is, as it is for the fourth of Cytowic's diagnostic criteria, that it is not clear that the emotional response of synaesthetes should be treated as an essential property of synaesthesia rather than a response synaesthetes make to their experiences.<sup>82</sup>

All that can usefully be gleaned from this list are the first and third features. Synaesthesia is characterised by discrete unelaborated experiences, which are consistently elicited by stimuli usually associated with a different sensory modality. Of more interest are the experiments Cytowic developed and from which he argued for the distinctiveness of synaesthesia as a psychological process. These experiments were conducted on two subjects each having different forms of synaesthesia.

One (MW) had what Cytowic sometimes calls 'geometric taste' and the other (JM) had what is generally known as 'coloured hearing'.<sup>83</sup> Under experimental conditions Cytowic's two subjects produced a range of responses to a variety of stimuli. In the one case MW experienced a set of shapes in response to a set of tastes. In the other case JM experienced a range of colours in response to a range of sounds. Controls who were not synaesthetic were similarly tested with tastes and sounds. They were asked to make associations between the tastes and shapes and between the sounds and colours. Cytowic found that the difference in ranges of responses between the two synaesthetes and the controls was significant. The responses of the synaesthetes were significantly restricted in range in comparison to those produced by controls. Non-synaesthetes would respond to the tastes with a wide variety of different shapes and to the sounds with a wide variety of colours. The shapes MW experienced were mainly restricted to circles and pyramids, which at the same time showed an ordered transformation. The colours JM experienced were associated with a cluster of frequencies. This indicated to Cytowic different forms of mediation between primary and associated experiences in synaesthetes and controls. In particular

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<sup>82</sup> For a critical discussion of Cytowic's view of emotion and its relation to reason see Korb 1996: section 3.

<sup>83</sup> MW's experience of tactile sensations in response to gustatory stimuli is described by him thus: 'When I taste something with an intense flavor the feeling sweeps down my arm into my fingertips. I feel it - its weight, its texture, whether it's warm or cold, everything. I feel it like I am grasping something.' Cytowic 1993: 4.

it suggested to him that the cross-modal association manifested in synaesthesia was the result of physiological processes operating at an early stage of perceptual processing.<sup>84</sup>

Although Cytowic believes that synaesthesia is marked by a unification of the senses, his theory is actually based on the idea that this occurs when parts of the brain that are normally involved in processing sensory information get disconnected from each other.<sup>85</sup> To be precise a stimulus causes the normal processing of the limbic system to become disconnected from the higher cortical areas allowing limbic processes to become conscious and experienced as the simple, discrete elements, in Cytowic's terminology the 'form constants', of synaesthetic experience. Form constants are, according to Cytowic, not just visual phenomena but constants that are apparent in any spatially extended sense. He claims that synaesthesia is the result of the premature display of normal cognitive processes.

Because of limited synaesthetic subjects for study, Cytowic bases his theory partly on synaesthesia's similarity to other psychological conditions: hallucination, eidetic imagery, epilepsy and drug-induced synaesthesia. Unfortunately for the theory, it is not clear that synaesthesia is relevantly similar to these processes. For one thing synaesthetic experiences are enabled by specific stimuli, which also produce normal phenomenal characters of experience. More troubling for the theory is the fact that Cytowic bases it on the physiological responses of a single case study of an unusual form of synaesthesia (MW). The evidence that this is produced by lower cortical processes is controversial. There has been no corroborating evidence from more advanced scanning techniques than those Cytowic used to support the view that the limbic system is involved in the more prevalent variety of coloured-hearing synaesthesia.<sup>86</sup>

Baron-Cohen and Harrison also see the question of distinguishing synaesthesia from other similar states of affairs as fundamental. In contrast with Cytowic, who

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<sup>84</sup> See Cytowic & Wood, 1982a & 1982b.

<sup>85</sup> Cytowic 1993: 163. Baron-Cohen and Harrison call this the 'Disconnection Theory'.

<sup>86</sup> More recent evidence suggests a neo-cortical location for synaesthesia. See Costa 1996 and the work of Baron-Cohen *et al.* Perhaps this only underlines the danger of claiming a general explanation for different forms of synaesthesia.

relies on a set of diagnostic criteria to distinguish synaesthesia, Baron-Cohen and Harrison have attempted to devise techniques, which demonstrate more conclusively that synaesthesia is present. The weakness of Cytowic's approach is that it relies too heavily on the subjects' own accounts of their experiences. In many cases all of Cytowic's diagnostic criteria might be met by a subject who would not be regarded as synaesthetic according to other evidence. Without further 'third-person' corroboration it is unclear whether what seem to be cases of synaesthesia really are so.

There are two aspects to the issue of distinguishing synaesthesia from other similar states of affairs. Firstly the other possibilities, from which real cases of synaesthesia have to be distinguished, need to be enumerated. And, secondly, methods of distinguishing real synaesthesia from other such possibilities have to be put in place.<sup>87</sup>

With regard to the first of these tasks, Baron-Cohen and Harrison, distinguish five possible conditions. All of them have more or less closely related features, and all of them might be described as a 'mixing of the senses' and thus denoted by the term 'synaesthesia'. But, since all of them have quite different origins, it would be inappropriate to treat them under the same heading.

'Developmental synaesthesia' is the term used by Baron-Cohen and Harrison to refer to the form of synaesthesia, which is idiopathic or naturally occurring. The term 'idiopathic' means for them 'a discrete natural disease category for which the cause is presumed to be within the biological make-up of the patient, but is currently unknown'. Baron-Cohen and Harrison note a number of characteristics of developmental synaesthesia, which seem initially to distinguish it. Developmental synaesthesia appears in early childhood. It is automatic, reliably caused and durable. It is a surprise to synaesthetes that others do not have similar experiences. It is vivid, although it can be dampened and enhanced by focused attention (although they do not specify what is to be understood by 'vivid' nor what the significance of this should

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<sup>87</sup> Baron-Cohen and Harrison 1997: 5-12. Part of the difficulty of studying synaesthesia, they suggest, has been the lack of appropriate subjects. Hence researchers have tended either to study cross-modal transfer in its place, as Marks has, or they have tried to use diagnostic techniques, as Cytowic has.

be). It is different from hallucination, delusion or other psychotic phenomena (although they do not specify in what way it is different from other such psychotic phenomena). And, finally, it is different from imagery arising from the power of the imagination (although they do not specify in what way it is different from such imagery).

Baron-Cohen and Harrison, along with several others who discuss synaesthesia, believe that developmental synaesthesia involves a breakdown in cognitive processing of some kind. Baron-Cohen and Harrison themselves believe synaesthesia involves a breakdown of barriers between cognitive modules. This suggestion is developed in more detail and put to the test in chapter two.

The term 'dysfunctional synaesthesia' may be used to refer to the first of two forms of acquired synaesthesia. Dysfunctional synaesthesia is caused by some sort of acquired neurological damage (perhaps stroke damage or some other form of damage to the brain). It usually occurs when major developmental processes have already taken place. The manifestations of dysfunctional synaesthesia are usually less complex in structure than developmental synaesthesia. The issue of the functionality or dysfunctionality of developmental synaesthesia will be considered further in chapter two.

The second of the two forms of acquired synaesthesia is 'drug-induced synaesthesia'. Synaesthetic experiences can sometimes be the transient product of psychomimetic drug use. These drugs mimic the effects of naturally occurring neurotransmitters in the brain. They can cause confusion between the sensory modalities, engendering the belief that a stimulus to one sensory modality is actually being perceived by another sensory modality.

Drug-induced synaesthesia often produces sensory combinations, which do not occur in developmental synaesthesia. But it has another feature not possessed by developmental synaesthesia (apart from the fact that it is acquired rather than developed). When synaesthesia is induced by psychomimetic drugs there seems to be a diminishment of or even loss of reality-monitoring. Developmental synaesthesia seems to be accompanied by no such diminution of cognitive abilities. So, despite the

fact that drugs can induce synaesthetic experiences it is not to be inferred that a similar explanation should be given of developmental synaesthesia to drug-induced synaesthesia.

Some cases of metaphorical synaesthesia were described in section 1.3. 'Metaphorical synaesthesia' refers to the first of two forms of pseudo-synaesthesia. There are many other references in the literature of the period of one sense acting as metaphor for the object of another sense. For instance, Huysmans, employs sound as a metaphor for tastes: 'Each and every liquor, in his opinion, corresponded in taste with the sound of a particular instrument. Dry curaçao, for instance, was like the clarinet with its piercing, velvety note; kummel like the oboe with its sonorous, nasal timbre, creme de menthe and anisette like the flute, at once sweet and tart, soft and shrill'.<sup>88</sup> In different artistic mediums there are other cross-modal associations. Kandinsky's abstract style of painting is intended to be a pictorial equivalent of music. That Kandinsky knew of cases of synaesthesia there seems little doubt.<sup>89</sup> Some of Scriabin's musical poems are intended to serve as musical accompaniments to displays of colours.

When associations between sensory modalities are portrayed by means of metaphors no reference is made to any reliable causal relation between one stimulus and the experience characteristic of another sensory modality. The intention is typically to express some other form of relation between the senses. The topic of metaphorical synaesthesia is best dealt with as one of metaphor rather than synaesthesia.

Finally the term 'associative synaesthesia' can be used to refer to the second of the two forms of pseudo-synaesthesia. Often a name and some other stimulus, invariably a colour, are associated when learning the written representation of a word. In this case no sensation is necessarily triggered and the subject will usually admit that the association is voluntary. It has been suggested that books having coloured alphabets, which are used to teach children reading skills, are at the root of some

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<sup>88</sup> Huysmans 1884: 84.

<sup>89</sup> Kandinsky 1977: 23-26 refers to a case in which 'an exceptionally sensitive person' could not eat a certain source without tasting blue i.e. without experiencing a feeling of seeing a blue colour.

purported cases of synaesthesia; sometimes letters are associated with objects and these objects are associated with colours, hence letters are associated with colours. Such are in reality instances of associational synaesthesia.

Baron-Cohen and Harrison mention a number of distinguishing features of developmental synaesthesia but they nevertheless stress that further evidence is required before a case be considered as one of synaesthesia. There are three further lines of evidence, which they argue are required to support the attribution of synaesthesia to a subject.

The first source of evidence comes from experiments designed to establish the genuineness of the condition in subjects who seem to manifest the features of developmental synaesthesia. The first such study involved a single subject (EP) who claimed to experience colours when she heard words.<sup>90</sup> The aim was to test for the stability of colour responses to letters (the 26 letters of the alphabet) and words (50 meaningful words in five semantic categories - animals, place names, objects, occupations and abstract terms - as well as names of days and forenames) over a 10 week interval, controlling for possible memory strategies. EP was not told of the memory test. The 103 items were also given to a 27 year-old lawyer of similar intelligence and excellent memory who acted as a control subject. The lawyer was asked to use strategies of association to relate the test items with a particular colour. The evidence that EP's was a genuine form of experience rather than an imagined association comes from the later retests. For EP retest on all 103 items 10 weeks later yielded identical descriptions. Retesting 8 months later also yielded perfect consistency. By contrast the control subject when retested on 10 random stimuli just 3 hours later was consistent on only 3 items and when retested on the entire list 2 weeks later was consistent on only 17% of the items, and most of these were for items that suggested a natural colour associate (e.g. 'white' for 'refrigerator'). The form of synaesthesia seemed to be related to words as wholes and unrelated to either phonemes or graphemes. Baron-Cohen *et al.* dubbed this form of synaesthesia chromatic-lexical synaesthesia.

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<sup>90</sup> Baron-Cohen *et al.* 1987.

A later experiment, using similar techniques, involved nine further subjects.<sup>91</sup> The results of this study showed that subjects with synaesthesia gave exactly the same colour correspondence 92.3% of the time, in spite of being tested again over 1.5 years later. Subjects without synaesthesia were only 37.6% accurate, in spite of being asked to try to remember the colours they associated with words and being tested only one week later. During this experiment Baron-Cohen *et al.* also tested to see whether the variety of synaesthesia was the same as had been indicated in the previous experiment. To achieve their aim subjects were also tested using five phrases with homophones (e.g. bare/bear, son/sun) and pairs with the same initial phonemes (e.g. knock/nice, writer/rice). These would allow chromatic-lexical, chromatic-phonemic and chromatic-graphemic synaesthesia to be distinguished. Chromatic-lexical synaesthesia occurs when a word as a whole enables a colour. Chromatic-phonemic synaesthesia occurs when the sound of a word enables a colour and chromatic-graphemic occurs when the written letters of a word enable a colour. Since colours seemed to be enabled by the first letter of words rather than the word itself or its constituent vowels in all nine subjects Baron-Cohen *et al.* concluded that the subjects experienced chromatic-graphemic synaesthesia. What the subjects heard seemed to be transformed into a graphemic representation, which in turn produced the experience of a colour. However many of the subjects did respond to vowel sounds. The experimenters argued that the possibility of a neurological explanation was raised not only by the consistency of vowel responses across these subjects but also the agreement of these responses with reports of over a century ago.

The second means of support comes from advanced scanning techniques. In the technique of Positron Emission Tomography (PET) scanning brain activity is mapped in three-dimensional space. The tomograph detects the distribution of a radioactive substance, which has been injected into the subject. In the study by Paulesu *et al.* 1995 the radiotracer injected into the subject was O<sub>15</sub> (in the form of H<sub>2</sub>O<sub>15</sub>).<sup>92</sup> Since the oxygen radionuclide enters the bloodstream, the radioactivity in the brain is proportional to regional Cerebral Blood Flow (rCBF). When areas of the

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<sup>91</sup> Baron-Cohen *et al.* 1993.

<sup>92</sup> Paulesu *et al.* 1995.

brain are involved in increased neuronal function, an increase in rCBF is demonstrable within seconds. As the  $O_{15}$  decays it emits positrons (positively charged electrons), which collide with electrons and mutually annihilate, producing two gamma rays, emitted at 180 degrees to one another. The PET camera is able to detect these paired emissions and builds a map of the rCBF in the subject's brain. The results from two or more processes are compared. This is the subtraction method, so called because rCBF bloodflow maps are subtracted from one another in order to see which brain areas are activated. The result of subtracting the map of process x from process y is to indicate the brain areas active in process y.

Paulesu *et al.* investigated six subjects with synaesthesia for words (but not other sounds), and six control subjects. All the subjects were blindfolded and asked firstly to listen to words played through headphones and then to listen to sounds (pure tones of varying pitch) played through headphones. The blood flow maps for synaesthetes listening to words showed significant differences in brain activity in areas traditionally believed to subserve visual processing when compared to blood flow maps, firstly, for synaesthetes listening to tones and, secondly, for control subjects listening to words or tones. In synaesthetes, a number of additional visual associative areas, including the posterior inferior temporal cortex and the parieto-occipital junction were activated when listening to words. The posterior inferior temporal cortex has been implicated in the integration of colour with shape and in verbal tasks, which require attention to visual features of objects to which words refer. It is believed that some of these brain areas are those which underlie the transition from viewer-centred to object-centred representations.<sup>93</sup> Synaesthetes also showed activations in the right prefrontal cortex, insula and superior temporal gyrus. By contrast, no significant activity was detected in relatively lower visual areas, including V1, V2 and V4. In short most notable was the comparatively greater activation of visual association areas in subjects with synaesthesia. Paulesu *et al.* proposed that the brain activity detected in synaesthetes were the neurophysiological counterpart of synaesthetic perception.<sup>94</sup> These results have been confirmed by fMR imaging.<sup>95</sup>

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<sup>93</sup> See Goodale 1995.

<sup>94</sup> One of the conclusions they drew from this was that a conscious visual experience can occur in

The third means of supporting the view that synaesthesia is a genuine and distinct condition has come from genetic studies of the families of synaesthetes. In one recent study the pedigrees of seven families was ascertained. The genetic markers suggested that the condition is transmitted as an autosomal or dominant X chromosome-linked condition.<sup>96</sup> Other studies, which show that synaesthetes are predominantly female, confirm the view that it is a dominant X chromosome-linked condition. There is however some dispute about the actual figures. In the U.S. Cytowic 1989 found a ratio of 3:1 in favour of females from the cases he had communicated with, while in the U.K. Baron-Cohen *et al.* 1993 found a ratio of 8:1.<sup>97</sup>

A genetic difference suggests a developmental difference. There are no direct neural connections between auditory and visual areas of the brain in the adult. However in the early development of many species of mammals there is evidence of transitory direct neural connections between visual and auditory areas.<sup>98</sup> One hypothesis is that these connections continue to exist in some adults causing synaesthetic experiences.<sup>99</sup> Maurer claims that human babies normally mix the input from different sense organs.<sup>100</sup> Some evidence for this comes from a study of one-month-old children.<sup>101</sup> After having been presented with a patch of white light for twenty trials, they are then presented with bursts of white noise of different intensities. Interspersed with the bursts of sound were presentations of the original patch of white light. It was found that heart rate typically increased as a function of noise intensity. However, at one noise intensity (74dB) the increase was significantly reduced. Lewkowicz and Turkewicz argue that the children were responding to the auditory

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the absence of activation in the primary visual area, V1, implying that high level associative visual areas can contribute on their own to conscious visual perception.

<sup>95</sup> See Gray *et al.* 1997.

<sup>96</sup> Baron-Cohen *et al.* 1995.

<sup>97</sup> On the feasibility of genetic analysis in synaesthesia see Bailey & Johnson 1997.

<sup>98</sup> See Kennedy *et al.* 1989 & 1997.

<sup>99</sup> The hypothesis is by no means original. See Bleuler & Lehmann 1881 and, slightly more recently, Myers 1911 and Downey 1912. There is some experimental evidence to suggest that babies are able to transfer the information they receive from one sensory modality, such as touch, to another sensory modality, such as vision, for they are able to recognise by sight objects, such as dummies, they have only been in contact with by touch. See Meltzoff & Borton 1979.

<sup>100</sup> Maurer 1993, reprinted 1997.

<sup>101</sup> The original study is described in Lewkowicz & Turkewicz 1980.

stimuli in terms of their similarity to the previously presented visual stimuli. Maurer uses this to support her view that there is a stage in normal development in which infants mix the input from different sense organs.<sup>102</sup>

Baron-Cohen & Harrison have suggested that, although genes may predispose subjects to synaesthesia, it is possible that specific brain structures might also be influenced by the environment of the infant.<sup>103</sup> It is well-known that visual experience is required for the normal development of vision. It may be that the environment somehow reinforces transient synaesthetic connections. Something would be required to trigger the reinforcement. It is not clear whether stimuli such as coloured alphabets would be sufficient. It may be that synaesthetes are particularly susceptible to such reinforcement.

It is not yet clear what the mechanism controlled by the genes and their related alleles would be. It might be the regulation of the migration of neurons or it might be the paring off of selected neuronal pathways. If one or other of these are true this would provide further evidence against theories of synaesthesia discussed earlier, which place the explanation with psychological associations.<sup>104</sup>

### 1.6 *The Philosophical Relevance of Synaesthesia*

Synaesthesia has so far been considered from a psychological point of view. The purpose of the previous sections has been to show that there is an interesting psychological phenomenon to be studied. The aim of the present section is to outline

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<sup>102</sup> She cites further evidence as support for her view. Auditory evoked potentials to language evoke a potential in the visual area of the brain, which is not evoked in older subjects. Also potentials that are normally only increased by tactile stimulation are also increased in infants by white light. Another related theory of synaesthesia derives from the evidence for neurons which respond to both and visual and tactile stimuli. Halligan *et al.* forthcoming have suggested that synaesthesia might arise when the brain has not got sufficient information to distinguish the source of a stimulus, only the ambiguous response of the bimodally responsive neurons.

<sup>103</sup> Baron-Cohen & Harrison 1997: 116-7.

<sup>104</sup> The breakdown of barriers between processing areas might involve a lack of differentiation of sensory areas of the brain or a further development of neurons once the brain has undergone differentiation. Both of these alternatives have already been described in 1.2 with reference to the literature of the nineteenth century.

briefly what will be explored at more length in the remaining pages: the relevance of synaesthesia for philosophy.

Consider the following passage from Merleau-Ponty's *The Phenomenology of Perception*:

Seen in the perspective of the objective world, with its opaque qualities, and the objective body with its separate organs, the phenomenon of synaesthetic experience is paradoxical. The attempt is therefore made to explain it independently of the concept of sensation: it is thought necessary, for example, to suppose that the excitations ordinarily restricted to one region of the brain - the optical or auditory zone - become capable of playing a part outside these limits, and that in this way a specific quality is associated with a non-specific one. Whether or not this explanation is supported by arguments drawn from brain physiology, this explanation does not account for synaesthetic experience, which thus becomes one more occasion for questioning the concept of sensation and objective thought. For the subject does not say only that he has the sensation both of a sound and a colour: it is the sound itself that he sees where colours are formed. This formulation is literally meaningless if vision is defined by the visual quale, and the sound by the acoustic quale. But it rests with us to word our definition in such a way as to provide it with a meaning, since the sight of sounds and the hearing of colours exist as phenomena. Nor are these even exceptional phenomena. Synaesthetic perception is the rule, and we are unaware of it only because scientific knowledge shifts the centre of gravity of experience, so that we unlearn how to see, hear, and generally speaking, feel, in order to deduce, from our bodily organization and the world as the physicist conceives it, what we are to see, hear and feel.<sup>105</sup>

This passage exemplifies the primacy Merleau-Ponty gave to what is delivered to the subject in perceptual experience. Merleau-Ponty considers synaesthesia to be of considerable philosophical importance just because he assumes the primacy of the subject's perceptual experience and synaesthetic experiences are taken to be perceptual experiences. The following thesis endorses the view that synaesthesia be considered as of interest for philosophy, although, in nearly all respects a perspective and final position opposite to that of Merleau-Ponty will be taken.

Merleau-Ponty mentions a number of issues here, which will become of central concern in what follows. There is the issue of how we should talk of this unusual condition. Earlier in this chapter the adoption of the technical terminology of 'synaesthesia' and the suggestion of the less technical terminology of 'coloured hearing' were outlined. Why should we use such terminology rather than that of

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<sup>105</sup> Merleau-Ponty, 1962: 228-9.

'hearing colours' and 'seeing sounds'? Merleau-Ponty remarks that 'if vision is defined by the visual quale, and the sound by the acoustic quale' then it cannot be the case that experiences involving auditory quale can be acts of seeing. Presumably it is assumed that visual qualia somehow involve colours and auditory qualia somehow involve sounds. According to Merleau-Ponty this then means that sounds cannot be seen, nor can colours be heard; a metaphysical claim comes to be based on a conceptual claim. But then this runs counter to the statements of the synaesthetic subject who does not claim 'only that he has the sensation both of a sound and a colour: it is the sound itself that he sees where colours are formed'. As Merleau-Ponty notes this formulation would be meaningless if the concept of seeing essentially involved 'visual quale'. The point Merleau-Ponty is driving at is that it is the perceptual experience which has primacy. It is perceptual experience on which all other knowledge is ultimately based. According to him the experience of synaesthetes supports the claim that 'the sight of sounds and the hearing of colours exist as phenomena' and the claim should be credited because it is founded on experience. Since it is then for us to word our definition on such evidence we should not define seeing in terms of visual quale and hearing in terms of auditory quale. There are two issues here. Firstly do synaesthetes really claim to hear colours and see sounds? And secondly, if they do, should this make any difference to the way we think of synaesthesia?

In order to respond to this second issue properly we might want to know more about what it is like to be a synaesthete. Synaesthesia offers a test for recent philosophical theories of phenomenal experience. Considering unusual psychological conditions should not be controversial, for a number of psychological conditions have already been employed as a means of testing philosophical theories: blindsight in the context of the philosophy of consciousness,<sup>106</sup> and visual agnosia in the philosophy of perception.<sup>107</sup>

There is underlying the issue of theories of phenomenal character the issue of what synaesthesia can tell us about the nature of perception and mind more generally.

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<sup>106</sup> See Kirk 1994 and Tye 1995 for discussion.

<sup>107</sup> Lowe 1993.

Merleau-Ponty says that 'the attempt is therefore made to explain [synaesthesia] independently of the concept of sensation'. He gives one frequently cited hypothesis: 'the excitations ordinarily restricted to one region of the brain - the optical or auditory zone - become capable of playing a part outside these limits, and that in this way a specific quality is associated with a non-specific one'. He is right in pointing out that 'whether or not this explanation is supported by arguments drawn from brain physiology, this explanation does not account for synaesthetic experience', for we cannot directly understand what the properties of the mind are from those of the brain. The process of understanding the mind involves much more than simply reading mental properties off from the properties of brain. Merleau-Ponty thinks that synaesthesia is another reason for questioning the objectivity of our thought.

In the next chapter a different stance is taken. It will be clear that how synaesthesia is to be explained cannot be inferred directly from neural properties. One might think that it could be if synaesthesia were a pathology of the brain. Studying pathologies of the brain is accepted as a methodological tool in neuropsychology for uncovering the structure and function of the mind. Synaesthesia is of interest because it is not immediately clear whether it should be understood in the way that traditional neuropathologies should be understood, namely, as a breakdown in the components of a functional system. So the next chapter considers the question of whether the additional neural structure (if that is indeed what it is) underlying synaesthesia should be considered as giving rise to additional functions. The chapter considers how we are to fit synaesthesia into a picture which views the mind as being at least partially composed of distinct cognitive modules. More specifically, the question is posed as to whether synaesthesia involves the emergence of an extra module or a breakdown in modularity. Synaesthesia is, in turn, used to test and ultimately revise the view that the mind is partially constituted by modules having a set of nine characteristic properties. This will also give a response to Merleau-Ponty's (and some others') claim that synaesthesia is the rule.

But where does this leave the primacy of the deliverances of experience to the subject? The issue of perceptual experience is, so it is often claimed, difficult to

accommodate within traditional psychological methods. It is for this reason that the question of the nature of experience has occupied philosophy so much recently. The question of the nature of experience arises forcefully in the context of synaesthesia. Chapter three focuses on this and, in particular, on whether synaesthesia can be used as a way of motivating the existence of so-called 'qualia'.

Having considered the implications of synaesthesia for the structure of mind and the constitution of the character of experience, by chapter four we will be better situated to consider how we should talk of synaesthesia. Merleau-Ponty's suggestion that we need to revise our talk of perception in such a way that we should actually speak of synaesthesia as hearing colours and seeing sounds is rejected. In so doing the chapter focuses on the place of synaesthesia vis-à-vis normal perceptual processes. Considerations from previous chapters are further developed in order to shed light both on the metaphysical individuation of perceptual modalities and on how we know the distinctive perceptual modalities.

This thesis concentrates on coloured hearing. What merits the preceding considerations have might be supported if they could be generalised. Chapter five goes a small way in that direction.

## Chapter 2

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# Cognitive Modules, Synaesthesia and Functional Explanation

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### 2.1 *The Constitution of a Psychological Natural Kind*

Exactly how we should think of natural kinds in science is contentious. Fodor remarks that a natural kind might be initially thought of as: 'a class of phenomena that have many scientifically interesting properties in common over and above whatever properties define the class'.<sup>1</sup> He suggests that all cognitive modules are members of a psychological natural kind in this sense.

There are two ways in which Fodor's suggestion, taken in isolation, might be interpreted. On the first interpretation different types of alleged cognitive modules (such as visual processing modules and language processing modules) might constitute different psychological natural kinds in virtue of the possession by their respective tokens of certain scientifically interesting properties. Individual visual processing modules would be tokens of one type of module, the visual processing module, in virtue of one set of properties. Individual language processing modules would be tokens of another type of module, the language processing module, in virtue of a different set of properties. In other words, these module types might constitute different first-order psychological natural kinds. On the second interpretation all cognitive modules would belong to one natural kind in virtue of their common possession of scientifically interesting properties. This second interpretation is the more likely one in so far as Fodor further remarks that what initially defines the class is the functional similarity of all input systems. If Fodor's suggestion is true then cognitive modules might serve to distinguish psychology from other levels of enquiry.

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<sup>1</sup> Fodor 1983: 46.

The scientific investigation of so-called psychological modules stems in large part from a history of mapping the correlations between psychological features and physiological properties. Phrenology is a well-known early attempt to transform folk psychological theories of distinctive moral and intellectual faculties (underlying such abilities as verbal memory and spatial relations) into a properly scientific theory: the physiological bases of mental faculties were inferred from the careful measurement of the skull.<sup>2</sup> Following the primitive attempts of phrenology, over a century of cognitive neuropsychology has endeavoured to map the brain and divide it into discrete areas responsible for distinct psychological functions, firstly by inference from the effects of localised brain lesions on psychological function, then by observing the consequences of direct physical stimulation of specific areas of the brain, and most recently by scanning the brain performing well-defined cognitive tasks.<sup>3</sup>

More recently this project has been complemented by the theoretical task of articulating the concept of modularity which underlies many but not all such correlations. Pre-eminent amongst these is arguably Fodor's account. I shall call Fodor's view that the mind is, at least partially, composed of cognitive modules the *modularity hypothesis*.<sup>4</sup> Fodor claims that the mind is not fully explainable in terms cognitive modules; central systems would be required to cut across and thus relate the outputs of modular systems. He claims that cognition possesses a (more or less) tripartite functional arrangement: transducers (sensory organs) are analogue systems which turn proximal signals into co-varying neural signals, input systems are computational systems which perform complex inferential transformations on the

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<sup>2</sup> See Gall 1822-5.

<sup>3</sup> For an account of the history of neuropsychology by one of its most eminent current practitioners see Changeux 1985.

<sup>4</sup> Fodor 1983. Earlier arguments for modularity come from computational considerations. See Simon 1969. Marr 1976: 485 reiterates the computational considerations but also notes evolutionary considerations: 'Any large computation should be split up and implemented as a collection of small sub-parts that are as nearly independent of one another as the overall task allows. If a process is not designed in this way, a small change in one place will have consequences in many other places. This means that the process as a whole becomes extremely difficult to debug or to improve, whether by human designer or in the course of natural evolution, because a small change to improve one part has to be accompanied by many simultaneous compensating changes elsewhere.'

inputs they receive from transducers, and central systems operate on the representations of distal properties computed by the input systems.<sup>5</sup>

Input systems are, according to Fodor, cognitive modules, and, in turn, members of a psychological natural kind, in virtue of their possession of most, or all, of nine specified properties:

- (i) Input systems are domain specific.
- (ii) The operation of input systems is mandatory.
- (iii) There is only limited central access to the mental representations that input systems compute.
- (iv) Input systems are fast.
- (v) Input systems are informationally encapsulated.
- (vi) Input systems have shallow outputs.
- (vii) Input systems are associated with fixed neural architecture.
- (viii) Input systems exhibit characteristic and specific breakdown patterns.
- (ix) The ontogeny of input systems exhibits a characteristic pace and sequencing.

Fodor notes that these need not be considered individually as necessary conditions of modularity, but it is essential that a number of them be realised for the attribution of modularity and each property is anyway such that if several of the properties are realised then most of them are likely to be realised. What is significant for present purposes is that, taken together, they offer a jointly sufficient condition for the attribution of modularity: whatever possesses most or all of these properties should be regarded as a cognitive module.<sup>6</sup>

The purpose of the present chapter is to examine the nature of synaesthesia in the light of Fodor's modularity hypothesis. Synaesthesia will, in turn, be used to consider further the question of what constitutes a psychological natural kind such as

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<sup>5</sup> Fodor 1983: 38-46. More recently, evolutionary psychologists have argued that central processes are also subserved by modules and therefore, that the mind should be considered massively modular. See Tooby & Cosmides 1995. For a challenge to this view see Samuels 1998.

<sup>6</sup> Fodor 1983: 47 is explicit on this point: 'if there are other psychological systems which possess most or all of these properties then, of course, they are modular too'.

Fodor suggests. Synaesthesia, it will be recalled, is a distinct type of cross-modal association: it occurs when the stimulation of one sensory modality automatically triggers an additional character of experience that would normally be triggered by the stimulation of a second sensory modality. As previously mentioned cognitive neuropsychology standardly studies brains lesions as a means of investigating cognitive modules; where a local lesion has disrupted normal function in a characteristic way it may be inferred that a cognitive module having a particular function has been disrupted.<sup>7</sup> Whilst synaesthetic-like manifestations may be acquired in the presence of specific brain lesions, synaesthetic manifestations seem also to be the result of endogenous factors. It is this latter form of synaesthesia which will be of main concern here. One closely-studied form of synaesthesia manifests most, if not all, of Fodor's nine specified properties of modularity. Hence synaesthesia, according to Fodor's understanding, should be considered as involving the emergence of a new type of module. I shall call this proposal the *Extra Module* thesis (the EM thesis for short). The extra module thesis has been outlined by Gabriel Segal.<sup>8</sup> It is held by others, on the other hand, that synaesthesia involves a breakdown of modularity. Baron-Cohen *et al.*, for instance, have suggested that the above-mentioned form of synaesthesia indicates a breakdown of barriers between the speech and colour processing modules. I shall call this proposal the *Modularity Breakdown* thesis (the MB thesis for short).<sup>9</sup>

The modularity hypothesis is by no means undermined by this disagreement, indeed, the fact that both accounts presuppose the theoretical usefulness of postulating cognitive modules endorses the hypothesis.<sup>10</sup> Nevertheless, this

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<sup>7</sup> Although there are philosophical issues arising from this methodology these will not be the focus of the present discussion. See Shallice 1987 for a detailed consideration of a number of methodological issues arising in cognitive neuropsychology.

<sup>8</sup> See Segal 1997.

<sup>9</sup> See Baron-Cohen *et al.* 1993. For reasons given in the discussion of the fixed neural architecture of input systems the explanation for synaesthesia might lie not in the breakdown of properties of modularity but in the failure to develop certain properties of modularity. If this is so a slightly different thesis could be substituted for the MB thesis without significant implications for the overall argument.

<sup>10</sup> Opponents of cognitive modules typically argue that the nine purported properties of modularity can be explained just as well by other models of cognitive architecture such as production systems or connectionist systems. See Stillings 1989. Here I bracket this issue, although it might be that the

theoretical difference presents a clear challenge to the notion of modularity as characterised by Fodor: either it is correct as it stands and synaesthesia should be regarded as involving an extra cognitive module, which is thus a member of a psychological natural kind, or synaesthesia should not be so regarded and thus the properties Fodor postulates for the individuation of cognitive modules are insufficient for individuating modularity. Many philosophers take it for granted that a further story has to be told about the provenance of cognitive modules; one aim here is to focus that issue.<sup>11</sup>

Section 3.2 outlines the plausibility of the EM thesis by a rehearsal of the way the nine properties of modularity seem to be manifested by colour-graphemic synaesthesia. At the same time the discussion shows how those features can be explained in a different way by the MB thesis. Section 3.3 examines how the EM thesis originally arises from a computational, non-teleological view of function. Although this view of function is consistent with Fodor's view of function, it can be seen as being in some tension with his attitude to natural kinds; instances of natural kinds, according to Fodor, are those instances whose terms are the bound variables in proper laws. The claim to be endorsed here is that what distinguishes cognitive modules is that they can figure positively in equations of evolutionary fitness. Section 3.4 discusses the MB thesis as a consequence of a teleological view of function.

The following argument is another application of externalist considerations, in this instance to the constitution of a psychological natural kind. One natural consequence of an internalist approach is to view synaesthesia as an extra module. If one believes synaesthesia is a breakdown in modularity, then one needs to introduce externalist considerations to support this view. If one believes one needs to introduce externalist considerations to support the MB thesis then this externalist criterion should apply to the individuation of other cognitive modules. To decide between the EM thesis and the MB thesis a tenth property needs to be added to the list of

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direction of the present chapter can be construed as undermining support for cognitive modules, in so far as it emphasises the underdetermination of Fodor's modularity hypothesis by the present data.

<sup>11</sup> Thus we have both a classificational and an empirical issue. The issue is classificational in so far as the correct concept of modularity requires adverting to a tenth property. The issue is empirical in so far as whether this tenth property is instantiated is an empirical matter.

properties of modularity: input systems are teleofunctional kinds. Psychology is taken by Fodor (and others) to be an independent science. Synaesthesia can be seen as providing difficulties for that attitude. Section 3.5 reconsiders, in the light of the current remarks, some objections that have been raised against the possibility of psychological natural kinds.

## 2.2 *Two Theories of Synaesthesia*

If the traditional division of the sensory modalities is correct there could be a wide variety of types of synaesthetic connections: experiencing colours when perceiving sounds, experiencing tastes when perceiving colours, experiencing sounds when perceiving smells *etc.* Cases of several different types of synaesthesia have indeed been described.<sup>12</sup> Coloured-hearing synaesthesia is the most commonly occurring type of synaesthesia. And what Baron-Cohen *et al.* have termed chromatic-graphemic (hereafter CG) synaesthesia appears to be one of the most common forms of coloured-hearing synaesthesia. In coloured-hearing synaesthesia experiences of colours and shapes are triggered by experiences of sounds in general. In CG synaesthesia experiences of colours and shapes are triggered by the sounds of words via their spellings.

The experimental procedure adopted by Baron-Cohen *et al.* was designed to distinguish between a number of possible forms of coloured-hearing synaesthesia that appear to be associated with the auditory presentation of language.<sup>13</sup> Chromatic-lexical synaesthesia occurs when different spoken words produce experiences of colour in virtue of the particular words they are, i.e. there seems to be no clear determination of the colour either by the sound of the word, or by the alphabetical representation of the word, or by the meaning of the word. In an earlier experiment, Baron-Cohen *et al.* found that for their experimental subject: the spoken word 'Moscow' consistently produced a darkish-grey colour, with spinach-green and pale-blue in places; the spoken word 'Maria' was violet-blue; the spoken word 'fear'

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<sup>12</sup> See chapter one.

<sup>13</sup> Baron-Cohen *et al.* 1993.

produced a mottled light-grey colour, with a touch of soft green and purple and the spoken word 'Daniel' was coloured a deep purple, blue and red. There was no obvious semantic explanation for their subject's synaesthetic correspondences since the words 'man', 'male' and 'masculine' all produced different colours. (It is difficult to know what produced this subject's experiences of colour.)<sup>14</sup> Chromatic-phonemic synaesthesia occurs when different spoken words produce experiences of colour in virtue of their sounds, more particularly, it would appear, in virtue of their dominant vowel sound. The sound of the letter 'a' will often produce a red colour and the sound of the letter 'o' will often produce a white colour. Chromatic-graphemic synaesthesia occurs when different spoken words produce experiences as of colour in virtue of their spelling, generally in virtue of the first letter of a word. So the spoken word 'dog' might produce an experience of crimson via the letter 'd' or the spoken word 'tree' might produce an experience of the colour ochre via the letter 't'. Although there was some consistency of response amongst subjects in the more recent study, there was also some variability.

From their study of CG synaesthesia Baron-Cohen *et al.* concluded that a breakdown of barriers between modules might be responsible for synaesthesia generally. More recently, Segal has claimed that what their results might actually indicate is the emergence of an extra module and thus further confirmation of Fodor's modularity hypothesis.

The immediate task is to examine CG synaesthesia in the context of Fodor's nine specified properties and, moreover, to examine Fodor's nine properties of modularity in the context of synaesthesia. This will demonstrate the plausibility of the EM thesis. At the same time it will show how the MB thesis can also explain the manifestation of these nine features in synaesthesia. As should quickly become clear, the constitution of modules, via their nine defining properties, underdetermines the nature of modularity. The exercise is of additional interest in that it sheds some further light on the features of the nine purported properties of modularity.<sup>15</sup>

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<sup>14</sup> See Baron-Cohen *et al.* 1987.

<sup>15</sup> The literature on modularity is fast expanding. Specific challenges have been made to the details

(i) *Domain Specificity*. Synaesthesia has some interesting implications for domain specificity that do not yet seem to have been considered. One might have thought of six obvious candidates for input systems: one for each of the traditional sensory systems and one for language. According to Fodor this is not the 'intended doctrine'. The intended doctrine is that 'within (and quite possibly across) the traditional modes, there are highly specialised computational mechanisms in the business of generating hypotheses about distal sources of proximal stimulations'.<sup>16</sup> In the case of vision, candidates for input systems might include mechanisms for colour perception, mechanisms for the analysis of shape, mechanisms for the analysis of three-dimensional spatial relations and mechanisms for the recognition of faces. In the case of audition, candidates for input systems might include mechanisms 'that assign grammatical descriptions to token utterances' mechanisms that 'detect the melodic or rhythmic structure of acoustic arrays' or mechanisms that 'mediate the recognition of voices of conspecifics'.

What does Fodor mean by domain-specificity? Such modules as the preceding could have been domain-specific simply in virtue of the causal relations holding between them, sensory organs and properties of objects. If for instance the mechanism for the analysis of shape is only related to specific distal stimuli then 'it follows trivially that their computational domain qua mechanisms of visual perception is specific to the class of possible retinal outputs'.<sup>17</sup> And so on for the other computational mechanisms related to visual stimuli and the computational mechanisms related to stimuli of other types. This is not how Fodor conceives of domain-specificity. Nothing interesting about cognitive processing would follow from such specificity. It is consistent with domain-specific processing so defined that each

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of Fodor's modularity hypothesis from both philosophers and psychologists. On the issue of domain specificity see papers in Garfield 1989, especially those by Arbib and by Stillings. On the issue of the mandatoriness of central processes see Marlsen-Wilson & Tyler 1989. Putnam 1984 and Churchland 1989 have challenged the detail of the encapsulation of modules and the nature of their supposedly shallow outputs. See also Marlsen-Wilson & Tyler 1989 (with respect to the encapsulation of language processing modules) and Arbib 1989 (with respect to the encapsulation of visual processing modules). Marshall 1984 has challenged the impenetrability of the internal processing of modules, whilst Karmiloff-Smith 1994 has challenged the innateness of modules.

<sup>16</sup> Fodor 1983: 47.

<sup>17</sup> Fodor 1983: 48.

mechanism uses the same types of computations. According to Fodor, modules are specialised in virtue of the specific computational processes they utilise to generate the range of representations they produce. The specific computational mechanisms that are used to represent colours for instance cannot be employed to represent shapes.

Evidence for domain-specificity comes largely from experiments on language processing. For instance, Fodor focuses on the evidence that only a specific class of stimuli are 'capable of throwing the switch' for the perceptual systems that effect the phonetic analysis of speech. These mechanisms are different from those which effect the perceptual analysis of auditory nonspeech. The existence of only a small subclass of the logically possible linguistic systems is according to Fodor evidence of a speech input system which generates representations of distal linguistic utterances by means of idiosyncratic computational processes upon proximal acoustic signals. Whereas only humans possess computational mechanisms for processing language according to Fodor it is perfectly plausible that species other than humans have visual-object input systems which generate representations of distal objects by means of different types of computational processes on proximal light signals. Neither of these types of computational processes could perform the functions of the other. Another way of putting this is in terms of the different computational tasks each computational mechanism has to perform. The first seeks an answer to the question: 'how does the theory of language apply to the analysis of the stimulus now at hand?' The second seeks an answer to the question: 'how far to the nearest prototype?' The moral of all this is that the more elaborate the mechanism of an input system becomes so the more eccentric the stimulus domain becomes.<sup>18</sup>

How does synaesthesia impact on this discussion? Can the EM thesis accept Fodor's notion of domain-specificity as stated? Segal admits that it is not clear to what extent the module which realises CG synaesthesia is domain-specific. In CG synaesthesia there does on the face of it, appear to be a specific processing of

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<sup>18</sup> Fodor 1983: 51. Fodor notes some problems with the inference from the eccentricity of the stimulus domain to the specificity of processing mechanism: 'chess playing for example exploits eccentric information, but nobody wants to postulate a chess faculty'. The inference from modularity to eccentricity of domain is more plausible than the one from eccentricity of domain to modularity.

information in that representations of sounds are mapped onto representations of letters which, in turn, are mapped onto representations of colour. For instance, when a subject hears the word 'phonology' the underlying mechanism reliably produces the particular colour experience associated with the letter 'p'. It is commonly believed that there is a computational system that maps the sounds of words onto their spellings which are stored in a mental lexicon. The EM thesis claims that there is an additional capacity to process representations of one type - in this case colours - from representations of another type - in this case written letters - via a domain-specific mechanism. The trouble with this view is that it is not clear whether this really gives any additional support specifically to idiosyncratic computational mechanisms, as Fodor conceives them. For one thing non-linguistic information often produces synaesthetic representations of colour. Another difficulty is that it is not clear what computational task the alleged module would be undertaking. This problem is particularly sharp in that different subjects have different associations. One *ad hoc* modification to the thesis, which Segal advocates, would be to postulate a domain-specific component to CG synaesthesia and other components which may or may not be domain-specific to non-linguistic auditory inputs.

The MB thesis claims that, in the case of CG synaesthesia, there is a breakdown of barriers between the modules which typically process speech inputs and inputs from colour sources respectively. This, however, seems to raise a dilemma for the thesis. How, if computational domain-specificity is partially constitutive of the barrier between modules, is it possible for the information which has been processed by the speech processing module to be further processed by the visual processing module? Although breakdowns within modules can, and should be acknowledged, the breakdown of barriers between modules should be impossible because one module, by hypothesis, would provide a representation to which any other processing module should not be able to respond, except at the proper interfaces. In the present case, the speech processing module would provide a representation to which the visual processing module should, by hypothesis, be unable to respond. It might at this point be observed that the answer is easily available: the speech processing module already

seems to generate visual representations in the form of graphemic representations (again cognitive modules are not to be identified with perceptual modalities), so there will be no special difficulty generated by the domain-specific mechanisms. But, if this is the case, this is where the dilemma ensues; there seems to be no clear barrier between modules to break down.

One response might be that the speech processing module may normally produce graphemic representations of speech which typically fail to receive the attention of the central processing system. They only do receive the attention of the central processing system when there is a breakdown between the speech processing module and the colour processing module. In this case the breakdown of barriers would involve not domain-specificity but other properties of modularity. This may be a satisfactory response for CG synaesthesia, but there seem to be other forms of coloured-hearing synaesthesia, such as colour-phonemic synaesthesia, which do not require the mediation of graphemic representations. And there are other forms of synaesthesia. These forms of synaesthesia (which would coincide more closely with the breakdown of traditional notions of sensory modalities) suggest either that there are no computational domain-specific mechanisms preventing cross-modal associations or require that the mechanisms responsible for the extra phenomenal character of experience can somehow play an explanatory role. But any explanation along the second of these lines seems to play into the hands of the EM thesis. In order to maintain the MB thesis, it seems a revision of Fodor's notion of domain-specificity is required. But this need not be controversial. After all, there seems to be no clear consensus amongst psychologists concerning the specificity of computational processes underlying particular psychological abilities.<sup>19</sup> It may even turn out that synaesthesia is further evidence that the domain-specificity of modules is constituted by hardware rather than software.

(ii) *Mandatory operation.* The mandatoriness of operations captures the idea that once an input of the relevant kind is received by the sensory transducers, such as a

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<sup>19</sup> See Shapiro & Epstein 1998: 174 for further discussion.

token utterance or a written token of a language we understand, we cannot prevent ourselves from processing it in a way such that we are aware of it as a familiar linguistic token.<sup>20</sup> The output from our language comprehension system is a representation of an element of a language we understand rather than an unfamiliar noise or unfamiliar set of visible properties. This is not to deny that we are able to focus our attention upon other input representations, such as the phonological or the graphemic representation of language, but it demands considerable attentional resources.<sup>21</sup> Mandatoriness does not apply in the same way to non-perceptual processes: 'outside perception, the way that one deploys one's cognitive resources is, in general, rationally subservient to one's utilities'.

The experience of synaesthetes suggests that synaesthesia too has this property of modularity. Salient amongst coloured hearing synaesthetes' remarks is the remark that the colours evoked are automatic and unsuppressible. Synaesthetes sometimes remark that they can prevent their synaesthetic experiences but, consistent with the mandatory operation of modules, it seems as though they do this indirectly, by attending to other stimuli, as we ordinarily do if we are trying to ignore a stimulus.<sup>22</sup>

But if this supports the EM thesis it also supports the MB thesis. Synaesthesia could still be the result of a breakdown of barriers between modules such that the signal from one module cannot be prevented from reaching another module.

(iii) *Information is inaccessible to central processes.* Part of the reason for our ignorance about synaesthesia lies with the third of the specified properties of modularity. According to Fodor 'the computations that input systems perform typically proceed via the assignment of a number of intermediate analyses of the proximal stimulation', but the internal operations of input systems are inaccessible to

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<sup>20</sup> Fodor 1983: 52.

<sup>21</sup> Fodor 1983: 53.

<sup>22</sup> See the questionnaire response in Baron-Cohen *et al.* 1993: 423: 'They all recalled the surprise of discovering that this was not the case for everyone. All subjects also reported that the colours evoked were automatic and unsuppressible, and said that they saw the colour vividly, 'inside' their head'.

inspection by the subject.<sup>23</sup> If synaesthetes are able to deduce the association between graphemes and colours, such a deduction would be by processes one thinks of, typically, as central processes. So they cannot tell whether they have an extra module or suffer a breakdown of barriers between in modules. More than that, since whatever knowledge is at the level of detail that is typically elicited by psychological experiments, whether they have an extra module or suffer a breakdown in modularity is unavailable by direct means to anyone else. We have to look for further forms of explanation.

(iv) *Processes are rapid.* Evidence for the rapidity of synaesthetic processes is largely anecdotal, although some early attempts were made to measure them. Experimental evidence for the rapidity of synaesthetic processes comes from the last decade of the nineteenth century. Clavière describes experiments in which Beaunis and Binet asked synaesthetes to respond as soon as they experienced a colour in association with a stimulus.<sup>24</sup> The average time was .51 seconds. The average time for the recognition of letters alone was found to be .45 seconds. Clavière reports that Philippe even found that the time for letter recognition was greater than the reaction time for colours alone; the time until response to letters was .76 seconds; the time until response to colours was .70 seconds. These experiments have not been reproduced more recently, and anyway even if the relative rapidity of synaesthesia could be measured, it is not obvious that this would provide evidence in favour of either the MB thesis or the EM thesis.

(v) *Information is encapsulated.* We all suffer from perceptual illusions from time to time. One of the features of perceptual illusions is that, regardless of our beliefs about the world, we cannot change our perceptual experiences. This illustrates the property of informational encapsulation. Informational encapsulation is arguably the central defining property of Fodorian input systems. It is the property of a cognitive system whereby access to it by information from elsewhere in the individual's cognitive

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<sup>23</sup> Fodor 1983: 56.

<sup>24</sup> Clavière 1897.

system, especially feedback mechanisms from central processing, is denied. The guiding principle of information encapsulation is that as much information should be ascertained from the bottom-up before top-down processing is invoked. The reasoning behind this is that, since input systems are required to tell us how the world is, the representation of unanticipated stimuli is of primary importance.

Fodor discusses information encapsulation mainly with reference to language processing, although it can be vividly exemplified by processing of visual properties. The Müller-Lyer illusion is one example where information is encapsulated: we know that the two lines in the illusion are of the same length - that we have worked out by measuring them and comparing their measurements - however we cannot bring this to bear upon input processing. Another example: when we move our eyes the flow of images across the retinas is equivalent to what would occur if our eyes were stationary and the world were moving. The reason why we do not see the world moving back and forward before us, so the theory goes, is that neural centres which initiate movement feed information forward to the input systems, which interpret visual stimuli. The visual input system can thus discount alterations in the retinal flow. However, if you were to press the eyeball gently the world would appear to move. Although you know this, for you have yourself initiated the experiment, you can do nothing to compensate for the effect. The lesson, once again, is that such information is informationally encapsulated.

Synaesthetic experiences, in this respect, are like illusions which we cannot but be subject to. Consider the following observation reported by one of Cytowic's subjects: 'It is not an hallucination but it is hard for me to describe. As I look at a page, I see the colors there even though I see the colour of the real ink that's before me. I know it isn't there for real, but I still can't help seeing it. There is still a sensation that the colour is there'.<sup>25</sup> Although synaesthetes might reason that their experience is non-veridical, this is insufficient to prevent input systems from processing words as coloured. The processes, which produce the content of synaesthetic experiences, are encapsulated from other cognitive processes.

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<sup>25</sup> Cytowic 1989:43.

But again a direct, and seemingly unresolvable, disagreement between the MB thesis and the EM thesis seems to arise here. The EM theorist will argue that synaesthetes are unable to modify their experiences because the module which enables them is encapsulated from the belief that letters of the alphabet are not intrinsically coloured; the MB theorist will argue that synaesthetes are unable to correct their experiences because the reason for them lies in a pathology of the neural system.

It is worth briefly considering here, in the context of synaesthesia, the issue of the scope of modules. Are input modules divided into levels, or do putative levels of processing form component modules of input systems? One might think of the various representations in Marr's model of visual input processing - the grey level description, primal sketch, 2.5D sketch and object description - as corresponding to processing interlevels or to the outputs of individual modules.<sup>26</sup> If Fodor is right about the scope of the speech input module and the visual input module, CG synaesthesia could either constitute a breakdown between modules at an interlevel stage, more precisely, at the stage at which a representation of the graphemes of a word have just been generated, or constitute an extra module at the interlevel stage. If this is the generation of an extra module it might appear more plausible to postulate a number of smaller modules rather than one large Fodorian module as constitutive of input systems. Of course, if a number of small modules is the preferred option, CG synaesthesia could still be caused by the breakdown of barriers between them.

(vi) *Outputs are shallow*. We commonly draw a distinction between appearance and reality. Most things have a depth that is not immediately available to our inspection. In philosophy of science the issue is 'where to draw the line between observation and inference', in psychology the issue is 'where to draw the line between perception and cognition'.<sup>27</sup> Fodor takes it that what are to be classed as appearances ('observations' in philosophy of science and 'perception' in psychology) are more than what are often taken to be the appearances of things by philosophers - the perceptible properties, such as the visible properties colour and shape. According to Fodor, since the visual

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<sup>26</sup> See Marr 1982.

<sup>27</sup> Fodor 1983: 86.

input system is a module, which generates representations ready for use by the central cognitive system, these representations have to be representations of basic categories of objects. Rather than represent the world in terms of coloured shapes, which we then infer to belong to classes of objects, we perceptually represent objects as belonging to types. We see cats and dogs as cats and dogs not as coloured shapes. The reason for this Fodor suggests is that it is the computational task of the visual system to solve the question: 'how far to the nearest prototype?'<sup>28</sup> Representations of basic categories of objects are the shallow outputs of the visual input systems, which deliver information to the central processing system.<sup>29</sup>

In CG synaesthesia the output representations are of shape and colour. Here is how one synaesthete reported their experience: 'When I listen to music, I see the shapes on an externalised area about twelve inches in front of my face and about one foot high onto which the music is visually projected. Sounds are most easily likened to oscilloscope configurations, lines vary in color, often metallic with height, width and most importantly, depth. My favorite music has lines that exist horizontally beyond the screen area'.<sup>30</sup> Cytowic claims that synaesthetic experience involves discrete and generic items. By this he means that they are abstract.<sup>31</sup> Synaesthetic representations are clearly shallower than the output representations Fodor argues for.

This might be interpreted in a number of ways. Either there is an extra module which maps representations from the language input system onto the visual processing module, the output of which is shallower than is suggested by Fodor. Or there is a breakdown in the barriers between modules, either at an inter-level stage, as suggested by the Fodorian model, or between the barriers of smaller modules. A

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<sup>28</sup> Fodor 1983: 95.

<sup>29</sup> Relatedly for the language input system. Fodor claims it is a module which generates the type identification of sentences from their acoustic properties, via their phonetic constitution and the grammatical and logical structure of an utterance. The output of the language input module is to represent a token utterance as a type of utterance.

<sup>30</sup> Cytowic 1989: 24.

<sup>31</sup> On this point compare the questionnaire response in Baron-Cohen *et al.* 1993: 423 to the question: 'when you hear a word, do you see the colour in a particular part of your visual field, and does it have a particular shape?' 'Five out of the seven experimental subjects replied that the colour was not in a particular part of the visual field, whilst two insisted that it was always just above the centre. Six out of seven said that it had the shape of the word, whilst one said it had no particular shape.'

breakdown of barriers might explain the deliverance of representations, which are earlier in the overall processing order of the visual input system. Consideration of this property of modularity suggests either that Fodor was right about the type of output delivered by the visual input system, in which case synaesthesia is a breakdown of other properties of modularity. Or Fodor was wrong about the type of output delivered by the visual input system, in which case the question remains open as to whether synaesthesia is an extra module or a breakdown between modules.<sup>32</sup>

(vii) *Fixed neural architecture*. Fixed neural architecture would contribute to the constitution of the barriers between modules. (The extent of the constitution would depend upon the upshot of the earlier considerations of domain-specificity.) Positron Emission Tomography (PET) scans have been used to determine the particular areas of the brain active in CG synaesthetic experience.<sup>33</sup> The evidence suggests a dedicated link between language areas and visual association areas.

The equation is often made between localisation and modularity. As Fodor notes, modules are to be individuated functionally rather than physiologically.<sup>34</sup> Input modules may be distributed about brain tissue. We know neurons make connections across areas of the brain, therefore localisation does not appear to be a necessary condition for modularity. But does it nevertheless support the notion of modularity?

Segal points out that the evidence for localisation not only supports Fodor's claim that modules are realised in fixed neural architecture but this particular evidence for localisation supports the claim that there is an extra module at work. But once again the evidence is far from conclusive. The additional areas of activation are those which are believed to be already employed for the integration of colour with shape and in verbal tasks which require attention to the visual features of objects to which words refer. The inference is that the extra module would be realised in an independent area mediating the functional areas in use by both synaesthetes and controls (the language areas) and the functional areas in use by synaesthetes alone

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<sup>32</sup> For a discussion of the levels of processing at which associations might take place see Grossenbacher 1997: 160-3.

<sup>33</sup> The details are taken from Paulesu *et al.* 1995.

<sup>34</sup> Fodor 1983: 98.

(the visual areas). But the evidence we have is silent on this. The evidence is suggestive of modularity in so far as it is suggestive of fixed neural architecture, but it does not tell us whether this fixed neural architecture should be construed as an extra module or as a breakdown of the barriers between two modules.

How can additional neural architecture be construed as other than additional cognitive architecture? Perhaps synaesthetes develop extra neural connections as infants. There is an alternative possibility. It has been suggested that synaesthesia is a stage of development all neonates undergo. Modularity develops when neural connections are lost.<sup>35</sup> The manifestations of synaesthesia would in fact be better understood not as breakdown of barriers between modules but as the failure to develop the barriers between modules in the first place. (If this is true the wider implications, which form the topic of this chapter, remain the same. The MB thesis might be reconstrued as the breakdown of what breaks down the connections between modules). So the presence of additional neural connections does not necessitate additional cognitive processes, in particular, it does not necessitate additional modular processes. The issue is precisely one of how we are to characterise psychologically extra neural connections.<sup>36</sup>

(viii) *Characteristic pattern of breakdown.* Modules have traditionally been inferred from characteristic patterns of cognitive breakdown. For example, Marr's theory of visual processing stages has received some support from clinical cases in which one set of subjects are unable to process shapes and another set of subjects are unable to recognise objects.<sup>37</sup> In considering whether CG synaesthesia is a cognitive breakdown or whether it can itself be subject to cognitive breakdown we come to the heart of the matter.

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<sup>35</sup> See chapter one and Maurer 1993.

<sup>36</sup> It is questionable whether more careful study would help. Maybe further experiments, which allowed the subtraction of the functional areas in use only by synaesthetes, could be addressed to this. Perhaps specific additional neurotransmitters could be found. But even if the evidence supported additional neural architecture or chemistry of a specific type this would not be conclusive evidence for an extra module as opposed to a breakdown of barriers between modules.

<sup>37</sup> See Ellis & Young 1988 and Shallice 1988.

Each thesis can elicit support by means of negative criticisms of its rival. Consider the MB thesis from the point of view of the EM thesis. How can there be a breakdown of function involving the spread of information to other modules if the information is also processed correctly by the module which is supposed to be undergoing that breakdown? This is not like cases of neuropathology arising from injury or stroke in which there is an absence of normal output. In such cases breakdowns occur because an interlevel of the modular input systems or a component module breaks down. Current evidence suggests that cognitive function is not negatively affected by synaesthesia. On that evidence CG synaesthesia should not be regarded as a cognitive breakdown.

Now consider the EM thesis from the point of view of the MB thesis. It can firstly be argued that synaesthesia is not a breakdown of a particular module but a breakdown of those properties of modularity, which constitute the barriers between two modules. In that case the burden of proof can be returned to the EM theorist who needs to show what the characteristic pattern of breakdown would be. It is not clear just what would count as evidence of any characteristic pattern of evidence of breakdown in the CG module. Since it is not clear what the function of the CG synaesthesia mechanism is supposed to be, it is not clear what question it is seeking to answer (as it is for the language and speech input systems according to Fodor).<sup>38</sup> One response the advocate of the EM thesis can make (unconvincing as it will be to the advocate of the MB thesis) is that it is not necessary that all the properties of modularity be instantiated. It might be argued that the EM thesis falls with this, and so Fodor's characterisation of modularity stands. But actually a functional module underlying synaesthesia probably can be construed, as the next section shows, and thus an analysis of its elements indicated.

(ix) *Fixed Pattern of Development* Few would want to suggest that acquired synaesthesia (the occurrence of synaesthetic-like symptoms following neural damage or drug usage) indicates an extra module. Nevertheless, one cannot automatically

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<sup>38</sup> As Segal admits 1997: 220.

infer from this that all synaesthetic symptoms are the result of a breakdown of modularity. There are a number of important differences between acquired synaesthesia and endogenous forms of synaesthesia, in particular the occurrence of common patterns of development in the latter. Modules, according to Fodor, are to be characterised by their fixed pattern of development. Fixed patterns of development are controlled at the genetic level. If synaesthesia is characterised by genetic differences then it seems plausible that it too have a distinctive fixed pattern of development. Evidence indicates that synaesthesia runs in families and thus does have such a genetic component.<sup>39</sup> The genetic differences could explain the development of new processing capabilities.

Again, the fact that synaesthesia has a genetic component does not decide between the EM thesis and the MB thesis. If it is true that synaesthesia arises in adults because neural connections are preserved this could be accounted for by the genetic differences between synaesthetes and non-synaesthetes. The fact that synaesthesia has a genetic basis, and thus a fixed pattern of development, does not confirm the existence of an extra module. Even if the gene or genes for the CG mechanism are discovered, the proteins these genes code for are determined and the development processes they mediate are clarified, we may not be any closer to an answer to the question of whether the EM thesis or the MB thesis is the correct thesis.

As should be clear by now the presence of an alternative shows that each thesis is underdetermined by the evidence of synaesthesia. Even if the nine properties which are distinctive of modularity are necessary for the individuation of cognitive modules they do not appear to be sufficient. Something further is required to adjudicate between the two rival theses.

### **2.3 *Function and the Extra Module Thesis***

The concept of function operative in cognitive psychology is sometimes left

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<sup>39</sup> Baron-Cohen *et al.* 1996.

unspecified. When considering some cases of purported dysfunction - perhaps there has been damage to the brain through stroke or infection - there is little controversy over the attribution of dysfunction. The nature of function and dysfunction becomes more significant when considering a case such as CG synaesthesia, where the question of neuropathology is more controversial.

The EM thesis is originally a consequence of a computational, non-teleological concept of function and functional organization. According to Fodor the functions of psychological systems can be understood by comparison with the organization of idealised computing machines.<sup>40</sup> Idealised computing machines are closed symbol-manipulating devices. Their functional architecture amounts to a small number of interacting subsystems (tape, scanner, printer and executive) and a small number of primitive machine operations (stop, start, move the tape, read the tape, change state and print). The system functions in the way it does because of the physical dispositions of its components. If the central cognitive system is no more than such a symbol manipulator then it can be fully explained in local causal terms. In order to act as a relevant model of human cognitive processes such a computational machine has to be embedded within input systems which can allow the exchange of information between the machine and its environment. These input systems would model the modules of present interest. The way that input systems transform information from the environment into symbolic representations is not, in general, any different from the way the central system then operates on them. In particular, input systems are also solipsistic, in the sense that the internal mechanisms are all that count. Input systems thus function in a particular way because of the pattern of dispositional properties and causal relations which constitute them.<sup>41</sup> Additional processes, which have the features Fodor notes, should consequently be regarded as extra modules.

Segal grants that we often talk of computers as having goals, and that the having of goals is related to the functions certain computations have. But he

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<sup>40</sup> Fodor 1983: 38-46.

<sup>41</sup> Rey 1991 has extended the Language of Thought model central to Fodor's thinking about psychological states to sensations and the states associated with them.

emphasises that this is only a way of talking which could be fully understood in terms of local causal properties. For instance, when modular processing gives rise to visual illusions, according to Segal, the visual input system is not doing anything it should not be doing. It was not designed in such a way that it is now failing to fulfil the parameters of any design. The same can be said with respect to synaesthesia; when the CG synaesthesia module gives rise to illusions it is not doing anything it should not be doing for it was not designed in such a way that it is now failing to fulfil the parameters of its design. In short, Segal claims that cognitive systems in general and cognitive modules in particular, are what they are independently of their origins.

Segal argues that we can see that evolutionary considerations need not be adverted to once we take account of the 'parallel between physical and cognitive development'. His point is that 'if we want to understand how the various tendons and ligaments hold the knee joint together, or how the kidneys regulate fluids in the body, evolutionary considerations are beside the point'.<sup>42</sup> All we have to do is study their present capacities. It would make no difference 'if it was discovered that our ancestors had been constructed in a laboratory 30,000 years ago [...] this would not lead to any revisions of the technical sections of physiological books concerned with its actual functioning'. He accepts that evolutionary considerations can be a useful aid to research into the actual workings of a system; and they can be interesting in themselves. But he stresses that 'cognitive systems are what they are and do what they do independently of their origins, just as the actual workings of the knee joint or kidneys are as they are, whatever their historical origins'. In underlining his support for a Fodorian position he states: 'Ultimately, whether a cognitive system is a computer is a factual question about its intrinsic and current features'.<sup>43</sup> The trouble is that it is just not clear that cognitive systems are like such simple physical systems.

Computational functionalism can be related to a more general approach to functional explanation. Cummins has observed that Fodor made the connection between the analytical strategy in psychological theorising and functional characterisation without however extending it to a general account of functional

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<sup>42</sup> Segal 1997: 215.

<sup>43</sup> Segal 1997: 215.

explanation.<sup>44</sup> Cummins has himself offered a general account. According to Cummins, functional ascription and functional explanation arise from an analysis of a complex system into its component parts. He also argues that the function of any characteristic or property should be understood without reference to ends: the function of a part of a complex system is just the causal contribution it makes to a specified activity of the system. What the specific properties are of a component part,  $x$ , of a system,  $s$ , or, alternatively speaking what  $x$  functions as,  $\phi$ , depends upon the analytic account,  $A$ , the theorist has of the activity,  $\psi$ , of the system of which  $x$  is a component part. The idea is that if one can make sense of a system by ascribing it goals this is enough to justify the ascription (which does not mean that the ascription cannot then be fully understood in causal terms).<sup>45</sup> Cummins defines function in the following way:

$x$  functions as a  $\phi$  in  $s$  (or: the function of  $x$  in  $s$  is to  $\phi$ ) relative to an analytic account  $A$  of  $s$ 's capacity to  $\psi$  just in case  $x$  is capable of  $\phi$ -ing in  $s$  and  $A$  appropriately and adequately accounts for  $s$ 's capacity to  $\psi$  by, in part, appealing to the capacity of  $x$  to  $\phi$  in  $s$ .<sup>46</sup>

Consider cognitive modules. Against the background of explaining (A) the processing of representations ( $\psi$ ) of the visual system ( $s$ ) we can analyse the causal contribution or function of the neural system ( $x$ ) as a scene surface analyser ( $\phi$ ) because the capacity of the visual system ( $s$ ) to process representations ( $\psi$ ) requires the capacity of the neural system ( $x$ ) to represent the surfaces of objects ( $\phi$ ). So the Cummins explanation can be mimicked in the following way:

neural system ( $x$ ) functions as a scene surface analyser ( $\phi$ ) in the visual system ( $s$ ) (or: the function of the neural system ( $x$ ) in the visual system ( $s$ ) is to analyse scene surfaces ( $\phi$ )) relative to an analytic account (A) of the visual system's ( $s$ 's) capacity to process representations ( $\psi$ ) just in case the neural system ( $x$ ) is capable of analysing scene surfaces ( $\phi$ -ing) in the visual system ( $s$ ) and A appropriately and adequately accounts for the visual system's ( $s$ 's) capacity to process representations ( $\psi$ ) by, in part, appealing to the capacity of the neural system ( $x$ ) to analyse scene surfaces ( $\phi$ ) in the visual system ( $s$ ).

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<sup>44</sup> Cummins 1975: ft. 20.

<sup>45</sup> In this respect Cummins offers a more interpretative account of function than Segal, who claims that the function of a part of a system is just what it is disposed to do.

<sup>46</sup> Cummins 1975: 762.

It is clear why damage to the brain through stroke or infection would be dysfunctional on this account: if we assume that intact cognitive performance presupposes a system having a number of components all of which are required to operate in a well-defined way for the system as a whole to operate in a specified way then neuropathologies arise when components do not function appropriately within the system so specified. Of course, viewing neuropathologies as such depends upon viewing the systems to which they are related as cognitive systems which perform a determinate set of cognitive tasks.

With respect to CG synaesthesia, all that is required for an account of function is that one be able to characterise a system whereby inputs to the speech processing module reliably cause representations as of colour. Synaesthetic experiences, in which the sound of particular words are experienced as having distinctive colours, can then be assumed to be subserved by modules which compute the functions which are determined by the dispositional properties of their components. Against the background of explaining (A) the processing of representations ( $\psi$ ) of the synaesthetic system (s) we can analyse the causal contribution or function of the neural system (x) as a colour analyser ( $\phi$ ) because the capacity of the synaesthetic system (s) to process representations ( $\psi$ ) requires the capacity of the neural system (x) to represent its inputs as coloured ( $\phi$ ). So the Cummins explanation can be mimicked in the case of synaesthesia in the following way:

neural system (x) functions as a colour analyser ( $\phi$ ) in the synaesthetic system (s) (or: the function of the neural system (x) in the synaesthetic system (s) is to analyse the inputs as colours ( $\phi$ )) relative to an analytic account (A) of the synaesthetic system's (s's) capacity to process representations ( $\psi$ ) just in case the neural system (x) is capable of analysing inputs as colours ( $\phi$ -ing) in the synaesthetic system (s) and A appropriately and adequately accounts for the synaesthetic system's (s's) capacity to process representations ( $\psi$ ) by, in part, appealing to the capacity of the neural system (x) to analyse inputs as colours ( $\phi$ ) in the synaesthetic system (s).

An initial uneasiness might be felt about this approach. Cummins proposes that the effectiveness of such an analysis is proportional to the extent to which the capacities of the *analysans* are less sophisticated than and different in type from the

capacities of the *analysandum*. As the gap in sophistication and type between the capacities of the *analysans* and the capacities of the *analysandum* grows so there must be a related sophistication of the system. Since there is only any cogency in a functional explanation of a sophisticated system having complex capacities there is no point in sophisticated hypotheses about simple capacities. CG synaesthesia would certainly not involve as complex a system as either the visual input system or the language input system. Since there is no clear cut-off point, it is open to dispute whether CG synaesthesia would, nevertheless, be sufficiently complex.

A deeper difficulty with this view is that there is another possible explanation for synaesthesia. This is not just another background explanation, or analytical strategy, by which to characterise CG synaesthesia. This explanation does not fit in with the explanatory strategy because it denies that every causal property needs to have a function in a wider system. If a consideration of synaesthesia underlines the role of an analytical stance of a Cummins' type approach, it becomes even clearer that Segal's approach would also amount to one analytical strategy. Once the normativity of the analytical strategy is transparent principled reasons have to be canvassed for the application of the correct background explanation.

#### **2.4 Function and the Breakdown of Modularity**

One reason for adopting the MB thesis is, arguably, that it fits better with Fodor's own earlier suggestion about natural kinds. In an earlier paper discussing the unity of science and the relation between the laws of the basic sciences and the special sciences, Fodor suggests that we should think of natural kinds in science in the context of laws for: 'the kind predicates of a science are the ones whose terms are the bound variables in its proper laws'.<sup>47</sup> The special sciences are such that their natural kinds are realised by an indefinite number of different physical natural kinds. A disjunction of natural kinds cannot, according to Fodor, figure in laws. Consequently nomic bridge laws will not hold between the physical and the special sciences. So

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<sup>47</sup> Fodor 1974, reprinted 1981: 87.

psychological natural kinds for instance are irreducible to the laws and natural kinds of the basic sciences. The previous section adverted to generalisations but did not advert to wider law-like processes. Only this will provide us with the individuation conditions, which will allow us to distinguish genuine cognitive modules.<sup>48</sup>

This discussion can now be seen as belonging to a larger discussion about the relative merits of the computational and biological frameworks in psychology. Sober has argued with reference to psychological functionalism that 'function' is ambiguous and the doctrine was developed with the wrong meaning in mind. He favours a teleofunctional as opposed to a computational view of function.<sup>49</sup> Exactly how one should think of functional explanation teleologically is a matter of current debate. Common to the debate is the view that functional explanation should be a non-reducible form of explanation, and this because the function of an item is determined by the contribution it has made or does make to individual fitness.

Millikan argues for one version of proper functions (or teleofunctions): the aetiological theory. For Millikan, to describe the biological function of an item is not to describe its dispositional capacities, it is to describe the role that the ancestors of that item played in a historical process, including birth, development and reproduction over numerous generations. If individuals possessing a trait have been favoured by natural selection because their token traits have performed in a certain way, then that is the function of the trait. Thus function ascription involves saying what something is for by saying why it is there. Consideration of the biological context allows the selection of the relevant properties of a trait for proper function ascription among other of its properties, providing the opportunity for a distinction to be drawn between function and accident, and function and malfunction. If the function of a trait

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<sup>48</sup> This is not intended to provide maximally specific individuation conditions for cognitive modules. The suggestion is simply that these additional considerations are explanatorily useful. It is not that computational considerations are not interesting nor that they are not explanatorily useful; it is just that in the long run they are not sufficiently so. Of course, someone might maintain the computational account and yet be able to revise the nine jointly sufficient properties in some other way. It is hard to know what this would be.

<sup>49</sup> Sober 1985: 165. The argument to be endorsed here also has some parallels with the view that machine functionalism is 'too liberal' (to adopt the terminology of Block) and requires teleofunctionalism as a corrective. Lycan 1987 responds to Block's charge by arguing for teleofunctionalism.

is such because it has increased the fitness of individuals then any other property of the trait is accidental if it has not increased individual fitness. A property of a trait is a malfunction if it does not increase fitness and is different from a related property of the trait, which has historically increased fitness.<sup>50</sup>

One issue that divides the parties to the debate is how one is to relate teleological function and causal explanation. It should be recalled that, Segal, following Fodor, argues that psychological processes, as causal processes, can be studied without reference to their history. Millikan argues that teleological explanation is quite different from causal explanation. But it is not true that a consideration of history alone can introduce teleofunctional considerations and it is not true that such a stark contrast between teleological function and causal explanation must be preserved, as aetiologists maintain, in order to maintain the distinctiveness of teleological explanation. Walsh and Ariew have recently argued that the aetiological theory championed by Millikan amongst others is incomplete. Its incompleteness is particularly evident when the present utility of a trait is different from its past utility. They argue that functional explanation in biology must be analysed with respect to relevant regimes of selection. The relational theory they advocate claims that: 'the way a trait contributes to fitness may vary wildly according to the environment [...] one must specify the contribution to fitness with respect to a selective regime.'<sup>51</sup> The relational theory explains both the persistence of traits and why we should expect a trait to persist into the future. In this way Walsh and Ariew are able to present the further claim that functional explanation in biology can be viewed as a specific sub-category of functional explanation as characterised by Cummins - that category which is distinguished by the context of the contribution to average individual fitness: 'the evolutionary function of a trait token (with respect to a regime) is that Cummins function which constitutes the (positive) contribution to average fitness for tokens of the trait's type (with respect to that regime)'.<sup>52</sup> By

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<sup>50</sup> Millikan 1984.

<sup>51</sup> Walsh & Ariew 1996: 498.

<sup>52</sup> Walsh & Ariew 1996: 509.

reference to the external environment, teleofunctional explanation can both be viewed as an irreducible form of explanation and compatible with causal explanations.

This would go some way to satisfying Fodor's suggestion that the kind predicates of a science are the ones whose terms are the bound variables in its laws. The biological law-like explanation for the evolution of specific cognitive modules, simply put, would be that the ancestors of cognitive modules, as a means of processing information, would have caused a differential in average fitness between the individual organisms which possessed them and those which did not possess them, and thus an increase in the descendants of those ancestors of cognitive modules in the population.

The evolutionary psychologists Tooby & Cosmides argue that 'modules are kinds invented by natural selection during the species' evolutionary history to produce adaptive ends in the species' natural environment'.<sup>53</sup> Fodor certainly agrees that some account along these lines is required. 'Given the possibility that perceptual mechanisms could be continuous with the higher cognitive processes, one is tempted to ask what the point of the trichotomous functional organisational architecture could be. What, teleologically speaking, might it buy for an organism that has transducers and central cognitive processes to have input analysers as well?'<sup>54</sup> And he thinks that there probably is an answer to this question: 'implicit in the trichotomous architecture is the isolation of perceptual analysis from certain effects of background belief and set'. However he has his reservations about the details: 'To suppose that the issue is *Why, given that there are central processors, should there be input systems as well?* is to take for granted that the former should be viewed as phylogenetically prior to the latter. However, an equally plausible story might have it the other way round viz., that input analysers, with their relatively rigid domain specificity and automaticity of functioning, are the aboriginal prototypes of inference-making psychological systems'.<sup>55</sup> His conclusion from this is that the justification for postulating a functionally individuated class of input analysers distinct from central cognitive mechanisms should

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<sup>53</sup> Tooby & Cosmides : 1995: xiii.

<sup>54</sup> Fodor 1983: 43.

<sup>55</sup> Fodor 1983: 43.

not rest on evolutionary considerations but 'that there are interesting things that the input analysers have in common' in other words that modules are psychological natural kinds which are different from 'cognitive processes at large'. This might support his view that psychological mechanisms can be understood by looking at the mechanisms inside the body. However 'the interesting things that the input analysers have in common' are, in the case of synaesthesia, clearly not enough to distinguish membership of a natural kind; evolutionary considerations *do* have to be brought to bear on the issue. The difficulty of articulating the full evolutionary story, *contra* Fodor, is not, as a consideration of synaesthesia shows, a reason for eschewing evolutionary considerations as determinants of the properties of cognitive modules.

Whether synaesthesia is realised by a breakdown in modularity or by an extra module depends on how this purported module would contribute to the fitness of individuals. Baron-Cohen has argued that if the MB thesis is correct there has to be a clear cost to fitness produced by CG synaesthesia. The problem for the MB thesis is that CG synaesthesia does not appear to be maladaptive. Notable as a mark of its lack of cost to fitness is the fact that CG synaesthetes are surprised at finding that other people do not have the kinds of experience that they have.<sup>56</sup> Baron-Cohen tries to save the MB thesis by discussing a case in which a synaesthetic subject not only experiences colours when she hears sounds, but experiences sounds when she sees colours. The dysfunctional nature of synaesthesia, according to Baron-Cohen, only becomes apparent when the condition is bi-directional. But the MB thesis is credible without this line of reasoning for it is not the MB thesis which has to show a cost to individual fitness but the EM thesis which has to show a benefit to individual fitness.

Some evidence that synaesthesia does not increase fitness derives from its relative scarcity in the population.<sup>57</sup> It may be that the novelty of synaesthesia is such

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<sup>56</sup> Baron-Cohen 1996. The fact that a characteristic does not seem abnormal because it has always been there, clearly does not mean that it cannot have a cost to fitness. Equally, the fact that synaesthesia does seem to be a disadvantage in some cases does not mean that it confers an evolutionary disadvantage.

<sup>57</sup> It might here be pointed out that even if synaesthesia were frequent in the population this would not be enough evidence to show that it conferred an advantage. For it might be linked to genes which did confer benefit upon their possessors. Only if synaesthesia is at the focus of positive selection would it have an adaptive advantage and therefore a function.

that selection has not yet had time to act on it. In that case, what could the utility of synaesthesia possibly be? Synaesthesia does not allow individuals to perceive more, or the same more quickly, since the experiences had are non-veridical, for instance a synaesthete may experience a word to be coloured when it is not. It is hard to see how future selective regimes might allow synaesthesia to bestow a positive contribution to average fitness of an individual synaesthete. But it might be the case that synaesthesia does have a function, for teleofunctions are not always easy to discern. It is open empirical question. If synaesthesia does confer an advantage then we should say that there is an extra module here; the EM thesis would be vindicated.<sup>58</sup> If the EM thesis is wrong then synaesthesia need not be considered malfunctional; it need only be considered accidental. Synaesthesia can be regarded as accidental rather than malfunctional because it does not involve a breakdown of modules, but a breakdown of certain properties of modularity.<sup>59</sup>

Since we are dealing with two concepts of function here, so we are dealing with two concepts of modularity. I have tried to show that an examination of synaesthesia shows that the characterisation of modularity by computational considerations is insufficiently wide. It is the concept of teleofunction or proper function that allows us to pick out membership of a psychological natural kind such as Fodor suggests. Fodor claims that cognitive modules are members of a psychological natural kind because they possess nine distinctive properties. The preceding argument claims that we should consider cognitive modules as possessing a tenth property, which they share with other biological characteristics: input systems should be considered as teleofunctional kinds. One can accept the view that a consideration of cognitive modules contributes to the individuation of an irreducible level of enquiry without producing a radical discontinuity between it and other levels of enquiry. Much

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<sup>58</sup> Grossenbacher 1997: 156 suggests that additional colour labelling might serve as a natural cognitive resource when stimulus conditions preclude colour sensations, e.g. under poor lighting conditions perceived shape might automatically evoke colour imagery in order to facilitate memory retrieval for object recognition.

<sup>59</sup> It may be that some forms of synaesthesia, as the breakdown of the barriers of modules, are to be considered accidental because they do not prevent proper functioning, whilst other forms of synaesthesia are to be considered malfunctional because the breakdown of the barriers of modules prevents the module from doing what it was originally designed to do.

has been made recently of the use of evolutionary theory in cognitive psychology. The present discussion takes the view that considerations of teleological functions need not produce any radical departures for cognitive psychology; it is a further tool, which can help us to understand cognition. However, if we accept the MB thesis of synaesthesia we may have to view some of the other properties of modularity, such as domain-specificity of modules, in a slightly modified way.

### *2.5 Objections to Psychological Natural Kinds*

How does the notion of a psychological natural kind fit with standard philosophical theories of natural kinds? Fodor initially characterises the class of cognitive modules as constituting a natural kind in virtue of its members having many scientifically interesting properties in common over and above whatever properties initially define the class. This is, at least in one respect, consistent with the dominant account of natural kinds deriving from Kripke and Putnam.

Central to their account is the view that a natural kind term can be fixed before the correct or full scientific account of the kind in question is known. It is nevertheless the essential properties, which a scientific account eventually delineates, which determine the reference of natural kind terms. This situation arises because members of the linguistic community intend to refer to a natural kind even when they do not (or do not fully) know the properties of the alleged natural kind. Although Kripke does not give a detailed explanation of the process of reference fixing of natural kind terms he does outline the way it would proceed. He suggests that members of a linguistic community might come across several items all of which have the same appearance, infer that the items all belong to a natural kind and then introduce a term to refer to the supposed kind: 'in general terms for natural kinds (e.g. animal, vegetable, and chemical kinds) get their reference fixed in this way; the substance is defined as the kind instantiated by (almost all of) a given sample'.<sup>60</sup> But the meaning of the natural kind term, indeed whether we have been successful in naming a natural

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<sup>60</sup> Kripke 1980: 136.

kind, in fact depends on the underlying properties of the items referred to.

Relatedly, Putnam explains how a community is able to refer to natural kinds using the natural kind terms they already have. Speakers of linguistic communities are able to explain what they mean by a natural kind term, such as 'water', by pointing out samples of natural kinds and they are able to provide an explanation in this way because the sample ostensively so defined bears 'a certain sameness relation (say,  $x$  is the same liquid as  $y$ , or  $x$  is the same<sub>L</sub> as  $y$ ) to most of the stuff [...] speakers in [the] linguistic community have on other occasions called 'water''.<sup>61</sup> Whether some item or some stuff, superficially similar to items or stuff belonging to a natural kind, does belong to a natural kind, depends upon whether it has the same essential properties as the items or stuff originally involved in the fixing of the natural kind term.

One of the consequences of this view is that the properties, which may first have been used to pick out a natural kind, are neither necessary nor sufficient for individuating natural kinds: some item may have all the superficial properties of a member of a natural kind - e.g. fool's gold or mechanical cats - and still not be a member of the kind and something may have few if any of those properties and still be a member of the natural kind. What is relevant is whether the item or stuff has certain essential properties.

Cognitive modules were presumably first referred to on the basis of behavioural evidence, some evidence of crude differences in the brain and perhaps also the evidence of introspection on psychological processes, but anyway without our having a full scientific account of them. There are psychological processes such as synaesthesia, which appear to be explained by the presence of underlying cognitive modules. If the argument of the earlier parts of this chapter is correct scientific investigation is required to tell us whether what is first thought to be a cognitive module is indeed such. Something will count as a cognitive module and thus a member of a psychological kind if it possesses certain essential properties.

One objection to the notion of psychological natural kinds has however been raised by McGinn who has argued that there is another respect in which psychological

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<sup>61</sup> Putnam 1975: 225.

features and psychological predicates fit uneasily into the Kripke/Putnam model of natural kinds and natural kind terms.<sup>62</sup> The purpose of the present section is to offer a response to the argument and related arguments by considering what force they have if cognitive modules were taken to exemplify membership of a psychological natural kind, and externalistic criteria were required for individuation of such a psychological natural kind.

McGinn's wider objective is to support Davidson's argument for anomalous monism by denying that psychophysical laws are possible. He claims 'the absence of psychophysical laws would have consequences for the question whether mental states should be conceived of as natural kinds, whose essence is specifiable in physical terms of the brain'.<sup>63</sup> If there were no psychophysical laws then mental states could not be conceived as natural kinds because the 'co-satisfaction of mental and physical predicates' required by the standard model of physical natural kinds would be 'incompatible with the demonstrated lack of nomological tie between the two types of predicate'. In fact, he thinks the argument goes the other way around: 'it is precisely because mental predicates can be shown not to denote natural kinds, but rather to express concepts of a fundamentally different character that authentic psychophysical laws can be ruled out in advance'.<sup>64</sup>

For it to be true that a mental state  $\psi$  (he gives as examples of mental states propositional attitudes and sensations) has a physical real essence  $\phi$  it must be that a creature cannot instantiate  $\psi$  without thereby instantiating  $\phi$  and vice versa. If  $\psi$  and  $\phi$  do come apart then the  $\phi$  cannot, 'as a real essence must, determine the existence and identity conditions for  $\psi$ ' and therefore mental terms do not denote 'physically circumscribable natural kinds'.<sup>65</sup> If mental states do have physical real essences then it is plausible to assume that these will be discoverable *a posteriori*, just as the essences of other natural kinds (e.g. gold and water) are discoverable *a posteriori*. We can envisage inductively established correlations between mental and physical states, such

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<sup>62</sup> McGinn 1978, republished in 1991. References are made to the latter.

<sup>63</sup> McGinn 1991: 127.

<sup>64</sup> McGinn 1991: 127.

<sup>65</sup> McGinn 1991: 128.

as pain and C-fibre stimulation.<sup>66</sup> But according to McGinn, who follows Kripke on this issue, it is conceivable that pain and C-fibre stimulation do come apart, in which case  $\phi$  and  $\psi$  come apart, in which case  $\phi$  cannot, 'as a real essence must, determine the existence and identity conditions for  $\psi$ '.

What is 'chiefly remarkable' about the conceivability argument is that we are supposed to know that no mental state has a particular type of brain state as its underlying essence by *a priori* reflection. As McGinn points out 'it might well be thought that establishing a theoretical non-identity is just as empirical an exercise as establishing a theoretical identity'.<sup>67</sup> Elsewhere in the paper McGinn gives other related reasons to motivate the view that no physical real properties constitute the essences of psychological properties, chiefly that it only requires reflection on our common sense psychology to realise that reference to mental states is not constituted via implicit reference to intrinsic physical states but by reference to behaviour and introspection.<sup>68</sup> Since there are no other grounds for attributing mental states, in other words mental states have no empirical depth, nothing science can tell us will overturn our attributions. We cannot be wrong about the nature of our mental states in the way that we may discover we are mistaken about something which we took to be a member of a natural kind (think of Kripke's example of fool's gold or Putnam's example of mechanical cats) by finding out something about our physiology (which is not to say there are not other ways of finding out we were mistaken). These views are supposed to support the conceivability argument ('the grounding claim [for the absence of psychophysical laws] come in two parts which are strictly inseparable') and their persuasiveness is one with the persuasiveness of the conceivability argument.

Indeed, McGinn claims more than that mental states have no real physical essence, he claims that they also do not have an essence which can be construed in terms of a functional role or a mental substance. McGinn has three objections to the view that mental states can be considered as natural kinds in virtue of their distinctive functional roles. The first is the problem of holism: no mental state can be defined

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<sup>66</sup> Kripke: 1980: 146.

<sup>67</sup> McGinn 1991: 128.

<sup>68</sup> See McGinn 1991: 146-52.

without defining the whole system to which it belongs. The second is that real essences 'pertain to the constitution or internal structure of a kind, but functional role is not like that'. The third is that functional states are specified in an *a priori* and definitional fashion, whereas essences are not.<sup>69</sup>

It might here be pointed that there are natural responses to the above objections if the psychological natural kind one is considering has cognitive modules as its members. Cognitive modules are functional systems. Firstly, being modules entails that they are not holistic; they can be defined independently of other mental states as conditions (i), (iii) and (v) of Fodor's modularity hypothesis emphasise. Secondly, we have seen that it is important that we do refer to the intrinsic properties of modules as conditions (vii), (viii) and (ix) of Fodor's modularity hypothesis emphasise. Thirdly, cognitive modules are not individuated in a purely *a priori* fashion because we need to find out about the way they contribute to selection and this can only be done in an *a posteriori* fashion. To understand whether specific cognitive modules are realised by neural structures and *ipso facto* whether specific neural structures realise cognitive modules requires empirical investigation of the function of the supposed cognitive modules. This requires meeting all three of the above objections.

But these responses do not obviously touch on the conceivability argument. Could not cognitive modules and their physical realisations come apart? Amongst the modal intuitions Kripke discusses a pair are of most relevance here, namely that the mental state  $\psi$  could exist without the physical state  $\phi$  and that the physical state  $\phi$  could exist without the mental state  $\psi$ .<sup>70</sup> McGinn agrees with the first but rejects the second. His reason for rejecting the second intuition is that if two creatures differ with respect to mental states then they will differ with respect to behavioural dispositions, and if they differ with respect to behavioural dispositions they will differ with respect to their dispositions to bodily movements, and if they differ with respect to their dispositions to bodily movements they will differ with respect to their internal physical states. Therefore two creatures cannot differ with respect to their mental states

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<sup>69</sup> McGinn 1991: 134-6.

<sup>70</sup> Kripke 1980: 144-55.

without differing with respect to their physical states. A similar argument cannot be constructed against the first intuition.<sup>71</sup> Nothing so far conceded to the conceivability argument precludes the contingent relation between the mental and physical states being a realisation relation, and the important thing about a realisation relation is that 'the range of physical states fit to realise a given mental state can be indefinitely various, subject perhaps to the fact that they preserve the causal powers and dispositions of the realised mental state'.<sup>72</sup> The multiple-realisation of mental states means that 'no physical property could qualify as the real essence of a mental state'. According to McGinn, 'it is this feature of mental states [...] that lies behind Kripke's intuition of contingency'. Moreover it is not just that tokens of particular types of mental state have been observed to be realised by different physical states but that tokens of particular types of mental state can be known to be so realised *a priori*. So the issue actually focuses not only on an empirical claim of multiple realisation but on a conceptual claim of multiple realisability.

According to McGinn it is in virtue of the multiplicity of the realisation relation that the familiar model of reference fixing for natural kinds cannot be applied to psychological predicates. Even if a mental predicate is picked out by some feature or features, there will be no empirically discoverable essence which determines membership of the natural kind. (He uses this to buttress his objections to psychophysical laws.) Following from this McGinn argues that mental predicates do not involve other features of the Kripke/Putnam model of natural kinds: division of linguistic labour, significant regrouping and theoretical elimination.<sup>73</sup>

One might think again of cognitive modules here. There seems good reason to think that our talk about them will depend on a certain division of linguistic labour between experts and non-experts. Only experts will be able to tell us what cognitive modules there really are. Indeed further research might even indicate that the set of cognitive modules is an empty set. As a consequence of this significant regrouping and theoretical elimination of psychological terms might even result. So there seem to

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<sup>71</sup> McGinn 1991: 128.

<sup>72</sup> McGinn 1991: 129. The multiple realisation of the mental on the physical derives from Putnam 1967. It has been elaborated in Fodor 1974 and LePore & Loewer 1989.

<sup>73</sup> McGinn 1991: 132-3.

be some psychological features, which are subject to other considerations of the Kripke/Putnam model of natural kind terms.

But these responses do not obviously touch on the multiple realisability argument. One might think psychological properties are multiply realisable because they are in fact multiply realised. Putnam's original argument supposes such. But that argument also supposes that we can characterise a psychological property with sufficient precision to then show that the psychological property is realised by different physical states. Functional states, or more precisely Turing machine states, were supposed to be such characterisations. When reasons to doubt the tenability of characterising functional states in terms of Turing machine states arose Putnam suggested that functional states should be characterised in terms of an ideal psychological science.<sup>74</sup> A psychological theory does not 'pretend to give a complete description of all of a human being's psychological states', nor does it 'pretend to give all the causal relations between the psychological states'.<sup>75</sup> More recently Putnam has cast doubt on the plausibility of the ideal psychological theory that would be required to underpin functionalism: 'if there is an ideal psychological theory, that is, a theory that does everything that the functionalist wants a 'description of human functional organisation' to do (let alone a normal form for the description of the functional organisation of an arbitrary organism) then there is no reason to believe that it would be within the capacity of human beings to discover it'.<sup>76</sup> The thought behind this is that any description of our capacities that we are able to formalise is a description of a set of capacities that we are able to go beyond. Indeed Putnam claims that 'the property of being 'a description of human functional organisation' is itself such an unclear property that the idea that there is such a description even if we cannot recognise it surely goes beyond the bounds of sense'. Those who advocate multiple realisability as a premise in their arguments still owe us an account of how psychological descriptions could be given such that it can be confirmed they are multiply realised (or multiply realisable). If Putnam is right then that debt not only has

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<sup>74</sup> Putnam 1975: chapter 14.

<sup>75</sup> Putnam 1994.

<sup>76</sup> Putnam 1994.

not been repaid but cannot be repaid. To say pace McGinn that 'mental concepts [...] obey their own distinctive principles of application' is not enough to show that the properties they are supposed to pick out are multiply realised or multiply realisable. In this case psychological natural kinds might have real physical essences.

The present discussion arose originally from a modal intuition. It is worth looking at this modal intuition from another perspective, for this will help to understand the intuition behind multiple realisation. Levine has argued that the real upshot of Kripke's modal intuitions is not a metaphysical consequence but an epistemological one.<sup>77</sup> With both a standard scientific identity statement and a mental-physical identity statement neither statement is known *a priori*. Therefore 'they are both imaginably false. Yet, if they are true, they are necessarily true - they are not even possibly false'. The issue as Levine points out is how we 'reconcile the apparent contingency with the actual necessity'.<sup>78</sup> Following Kripke this is easy to do in the case when 'we think we are imagining a situation in which water is not H<sub>2</sub>O, in fact we are imagining a situation in which some substance which behaves superficially like water - but is not water - is not H<sub>2</sub>O'. Thus the illusion of contingency is explained. But a similar explanation cannot be given for the apparent contingency of the identity between a mental state and a brain state, 'for to imagine a situation in which one is experiencing a state superficially like pain just is to imagine a situation in which one is experiencing pain'. 'Conscious mental states are unlike external objects in that the standard distinction between how they appear and how they really are does not apply'.<sup>79</sup>

But all this establishes is the epistemological possibility that, for all we know, pain could exist without the underlying physical states it is in fact correlated with. But a further argument is still required to support the metaphysical thesis that pain does indeed exist in some possible world without the underlying physical states it is in the actual world correlated with. And, according to Levine, no good argument has been adduced to show this. Although the modal intuition does not bear the weight it

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<sup>77</sup> Levine 1993.

<sup>78</sup> Levine 1993: 122.

<sup>79</sup> Levine 1993: 122.

is supposed to it does nevertheless show us something interesting. It shows us that we have no good explanation for a physical/mental identity in the way that we have for physical identities. As Levine observes: 'I see the disanalogy between the water/H<sub>2</sub>O case and the pain/C-fibre case in the fact that there is an apparent necessity that flows from the reduction of water to H<sub>2</sub>O, a kind of necessity that is missing from the reduction of pain to the firing of C-fibres'. The reason for this is that 'if we consider the apparent contingency that attaches to [the physical/mental identity] we notice that it works in both directions: it is equally conceivable that there should exist a pain without the firing of C-fibres, and the firing of C-fibres without pain. However the apparent contingency of [the physical identity] only works in one direction. [...] While it is conceivable that something other than H<sub>2</sub>O should manifest the superficial properties of water, as Kripke suggests, it is not conceivable that H<sub>2</sub>O should fail to manifest these properties (assuming, of course, that we keep the rest of chemistry constant)'.<sup>80</sup> Whereas we have a chemical theory that explains the macro-properties of water, we have no such theory for the equivalent properties of mental states, such as the painfulness of pain. An explanatory gap exists between physical states and mental states.<sup>81</sup>

What gives rise to the modal intuition is not according to Levine the multiplicity of the realisation relation but our lack of understanding of the realisation relation.<sup>82</sup> Indeed it is more plausible to think that the multiple realisability intuition arises from the modal intuition via the presence of an explanatory gap. However in order to substantiate the multiple realisability claim one actually needs an explanation. So once it again it appears that the multiple realisability claim relies on weak foundations. Closing the explanatory gap so defined would not necessarily resolve the multiple realisability question since all that would have been shown is how and why a psychological property is realised by one type of physical property. To resolve the

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<sup>80</sup> Levine 1991: 128.

<sup>81</sup> The issue of the explanatory gap has received recent treatment from Tye 1999 and Block 1999. Tye argues that the initial plausibility of the explanatory gap arises from a conceptual confusion. Block argues for the plausibility of the gap but that no metaphysical consequences follow from it.

<sup>82</sup> McGinn 1991 chapter one discusses the reasons for the explanatory gap. He argues that we are cognitively closed to the mechanism whereby consciousness is realised by the physical processes.

multiple realisability objection what needs to be shown in addition is how and why a psychological property can only be realised by one type of physical property. Nevertheless it seems plausible to think that efforts to close the explanatory gap will also address the issue of multiple realisability.

The presence of the explanatory gap indicates that the theories, in particular the functional theories, we have seen unable to mediate the physical and the psychological in such a way as to explain how the latter is realised by the former. One approach to closing the explanatory gap might be to show how we are mistaken in our intuitions about the explanatory gap. This would provide a general dissolution of the problem of the explanatory gap. Another approach is to consider solutions to particular problems of the realisation of the psychological by the physical. Cognitive modules, if anything are, are the type of psychological entities which will be most amenable to explanation. If cognitive modules exist then there exist psychological entities the function of which would be constrained in a way that central cognitive functions are not.

Some suggestions were made in the previous sections in support of the view that modules could be characterised by a functional description. But if the function of cognitive modules could be precisely characterised then why should cognitive modules not be multiply realised? There is an important respect in which the view of cognitive modules as members of a natural kind outlined in the previous section does not fit with Kripke/Putnam model. The essential properties of cognitive modules *qua* psychological states are not only local physical properties as they are with other physical kinds; they include relational properties. The presence of relational properties has two consequences. Firstly as an empirical matter these factors will provide further constraints on what could realise a cognitive module. Only physical states which have been subject to evolution will constitute cognitive modules *qua* members of a natural kind. And not just anything will be able to evolve into a cognitive module: complex relations between genetic make-up and hence neural architecture and related factors in the environment are all required to constitute a member of a psychological natural kind. The properties, which individuate a psychological natural kind, will be much

more closely constrained than intuitions of multiple realisability suggest. But even if a given type of cognitive module were multiply realised, the second point is that this should not preclude one from thinking of its tokens members as members of a natural kind. The presence of local physical states *contra* McGinn though necessary are insufficient for membership of the psychological natural kind composed of all cognitive modules. Such is one way in which McGinn's argument might be responded to.

A second objection to psychological natural kinds has been developed by Kim.<sup>83</sup> Kim's argument forms a response to a line of thought developed by Fodor.<sup>84</sup> Although Fodor comes to a conclusion similar to that of McGinn, namely that if one assumes multiple-realisation then there can be no psychophysical laws, Fodor maintains the existence of psychological natural kinds and laws of the special sciences, which admit of exceptions. Fodor's argument is intended to explicate the purpose and thereby the unity of science: the purpose of science is not to 'find some natural kind of physics coextensive with each kind predicate of the special science. It is, rather, to explicate the physical mechanisms whereby events conform to the laws of the special sciences'.<sup>85</sup>

Fodor's argument runs as follows. Consider a law of the special sciences:  $S_1x \rightarrow S_2x$  (all events which consist of  $x$ 's being  $S_1$  bring about events which consist of  $x$ 's being  $S_2$ ). A science is constituted by its 'typical [kind] predicates, hence if  $S$  is a special science,  $S_1$  and  $S_2$  are not predicates of basic physics'.<sup>86</sup> In order for this special science law to be reducible to a law of physics,  $P_1x \rightarrow P_2x$ , the predicates that figure in the former have to be reducible to those predicates that figure in the latter, that is to say reduction requires, as a necessary and sufficient condition, that these predicates of the special sciences be related to the predicates of physics by bridge laws  $S_1x \leftrightarrow P_1x$  and  $S_2x \leftrightarrow P_2x$ . These bridge laws express event identities.<sup>87</sup> The token-identity of psychological and physical events permits the reduction of psychological

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<sup>83</sup> Kim 1992, republished 1993, references will be to the later.

<sup>84</sup> Fodor 1974 reprinted 1981, references will be to the later.

<sup>85</sup> Fodor 1981: 138.

<sup>86</sup> Fodor 1981: 128.

<sup>87</sup> Fodor 1981: 129-30.

laws to the laws of physics. The problem as Fodor conceives it is that the taxonomies and generalisations of the special sciences are deployed without reference to the physical properties they are related to and it is plausible on empirical grounds that the natural kinds which figure in the generalisations of the special science can be realised by different kinds of physical events. It is plausible to think that psychological kinds are realised by a disjunction of physical kinds:  $S_1x \leftrightarrow P_1x \vee P_2x \vee P_3x \vee P_nx$ . A better model of the unity of science must accommodate the fact that psychological generalisations such as  $S_1x \rightarrow S_2x$  are realised by disjunctive antecedents and consequents. Because disjunctions of kind predicates do not themselves count as kind predicates the 'bridge statements' connecting the special sciences and the basic sciences will not express laws. This model allows for exceptions to the generalisations of the special sciences; exceptions occur when a property  $P_1x$  to which the antecedent of a special science law can be reduced is not lawfully related to another property in  $P$ . The upshot for Fodor is that there need not be any single physical law underlying psychological laws, thus no physical natural kinds underlying psychological natural kinds. Psychological natural kinds and physical natural kinds are evidence of the fact that the world is divided up in different ways: 'not all the kinds (not all the classes of things and events about which there are important, counterfactual supporting generalizations to make) are, or correspond to, physical kinds'.<sup>88</sup>

Kim claims that considerations of multiple realisation (which he assumes for the sake of argument) rather than imply the autonomy of psychology undermines it: 'the popular view that psychology constitutes an autonomous special science, a doctrine heavily promoted in the wake of the multiple realisation inspired antireductionist dialectic, may in fact be inconsistent with the real implications of multiple realisation'.<sup>89</sup> Psychological predicates, so the multiple realisation argument goes, refer to states that can be realised by different physical states. We cannot take

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<sup>88</sup> Fodor 1981: 144. Churchland 1985 also argues that natural kinds are kinds that figure in laws; natural kinds are law-bound kinds. Identification of natural kinds is basic because identification of laws is basic to science. Churchland argues against Fodor that since there are only a few basic scientific laws, there are only a few basic natural kinds, the rest are pragmatic kinds. (Churchland would anyway resist the notion of cognitive modules, see Churchland 1988, and therefore such an explanation for synaesthesia as has been given here.)

<sup>89</sup> Kim 1993: 311.

the disjunction of different types of neural bases of, say pain, as the singular base of pain because the disjunction does not form a natural kind. The reason, as Kim explains, is that each disjunct would have different causal powers and thus enter into diverse causal laws. Jade turns out not to be a kind because it is comprised of two distinct minerals, jadeite and nephrite, each having dissimilar molecular structures and thus different dispositional properties. Psychological kinds like pain would be the same. Two plausible principles then lead Kim to the view that the irreducibility of psychology is not the right conclusion to draw. The first principle is the principle of the causal individuation of kinds: 'objects and events fall under a kind, or share in a property, insofar as they have similar causal powers'.<sup>90</sup> According to this principle each predicate of the disjunction should be considered as a member of a distinct natural kind in virtue of its own distinctive causal properties. The second principle is the causal inheritance principle: 'If mental property M is realised in a system at t in virtue of physical realisation base P, the causal powers of this instance of M are identical with the causal powers of P'. What Kim takes to be the true consequence of multiple realisability follows: the laws of psychology may be locally reducible to divergent physical laws but this does not imply that psychological kinds are kinds because they have anything intrinsic in common. Either mental kinds are themselves disjunctive kinds or mental kinds are not real kinds at all ('mental irrealism').

Kim presupposes that causal properties determine kinds and that the relevant kind of causal properties are determined by properties of local physical states. Suppose we attributed the possession of cognitive modules to different species. If it turned out that each of these species realised cognitive modules via different physical states then according to Kim we would in fact have species-specific psychological kinds not a 'proper natural kind'. But cognitive modules, so it has been argued, are also to be individuated in terms of non-local causal properties. So even if cognitive modules are realised by different physical systems there is no reason to think that they cannot be members of the same psychological kind if they function in the same way with respect to their environments. And by the same reasoning two psychological

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<sup>90</sup> Kim 1993: 326.

states which are realised by physical systems having the same local causal powers can differ with respect to their membership of a psychological natural kind. Consider the classic thought experiment refitted: synaesthetes in an environment in which their synaesthetic experiences conferred fitness and synaesthetes in an environment in which they did not. Only in the first case would synaesthesia be a process, which was mediated by a cognitive module, and thus mediated by a member of a psychological natural kind.

One final thought. There might be an interesting parallel between the psychological natural kind discussed here and other natural kinds concerning the issue of higher-order natural kinds. At the focus of discussions of natural kinds are usually the underlying properties of an item. On such a view biological species would count as a natural kind in virtue of its underlying genotype; a chemical element would count as a natural kind in virtue of its underlying atomic number; and a fundamental physical particle would count as a basic natural kind. The difficulties with this view are well-known: members of biological species have different genotypes, chemical elements can have different isotopes and fundamental physical particles can have opposite parities. It might be that we should look to the way these natural kinds belong to higher-order natural kinds. A biological species, such as *panthera leo* or *panthera tigris*, might be counted as a natural kind in virtue of the properties it has in common with other species, such as the propensity of its members to attempt reproduction; a chemical element, such as hydrogen or gold, might count as a natural kind in virtue of the properties it has in common with other chemical elements, such as the propensity to have a full outer electron shell; and fundamental physical particles, such as electrons and positrons, might count as basic natural kinds in virtue of the properties they have in common with other fundamental physical particles, such as the propensity to combine according to the laws of quantum electrodynamics.

This need not be in conflict with more traditional accounts of natural kinds; it may even be that these higher order properties are to be explained in terms of underlying properties. It seems likely that the propensity of the members of a species to attempt reproduction depends upon a commonality in their genotypes. One should

reckon underlying properties as constituting natural kinds in so far as they make sense of those scientifically interesting common properties of a natural kind. Relatedly, it might be that psychological natural kinds are so only because they belong to a higher-order natural kind, which is individuated by reference to the laws they instantiate. In this respect the language input system and the synaesthesia input system would both count as first-order natural kinds because they have properties in common which allow their membership of a second-order natural kind. That property would be individuated in terms of evolutionary consideration.

## Chapter 3

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# The Phenomenal Character of Synaesthetic Experience

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### 3.1 *The Composition of Phenomenal Character*

Suppose you hear a bell chime. Suppose you then turn and see the bell. You would, in each case, be the subject of a different kind of experience. For any such conscious perceptual experience it is generally accepted that there is something distinctive it is like for a percipient to undergo that perceptual experience: perceptual experiences have a phenomenal (or, alternatively speaking, a qualitative) character. Gesturing at a definition of the phenomenal character of experience is easy enough, explaining it has proved rather more difficult.

Synaesthesia, as a distinctive type of cross-modal association, has already been defined. Chapter two has also given a provisional explanation for it as a breakdown in certain properties of modularity. However the phenomenal character of synaesthesia was only marginally discussed in the context of the shallow outputs of modules in section 2.2. If synaesthesia occurs when the stimulation of one sensory modality automatically triggers an additional character of experience that would normally be triggered by the stimulation of a second sensory modality how is the phenomenal character of such synaesthetic experience to be explained? How, for instance, is the experience of a particular colour which is produced on hearing a bell chiming to be explained? And is an answer to this question of any relevance to the issue of the phenomenal character of experience more generally?

Gray *et. al* argue that synaesthesia might inform us about consciousness.<sup>1</sup> More specifically their aim is to provide empirical evidence to help decide between a number of competing hypotheses about what underlies conscious experience: whether

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<sup>1</sup> Gray *et. al.* 1997.

specific neural properties, or specific information processing properties or both types of properties. They note two possible explanations for synaesthesia: 'there are permanent neural connections between modalities which are not normally present' or there are 'learned associations between stimuli'.<sup>2</sup> They suggest that information processing models might presuppose the formation of learnt associations between stimuli, and that these processes might be multiply realised, in contrast to models advocating the necessity of specific neural states. They further suggest an experimental design, which might either allow them to decide between these two potential explanations or show that they cannot be differentiated. Their thought is that if the phenomenal character of synaesthetic experience is shown to be dependent on hard-wiring, rather than on learnt associations, then it may be the case that the 'particular features that characterise specific conscious experiences depend upon neural events, not upon information processing. If correct, this inference would further imply that much current effort to explain consciousness by appeal to information transactions that go on in non-neural systems, such as computers is fundamentally misdirected.'<sup>3</sup>

One might question the distinction they raise between neural properties and information processing properties. Explanations in terms of neural properties and information processing properties are not necessarily exclusive; the modularity hypothesis (which they even refer to) is an avowedly information processing model which also presupposes some sort of specific neural hard-wiring. Even if the results of their experiments were to indicate specific neural hard-wiring, it is not clear that this would tell us anything directly about the respective merits of the two theories of conscious experience they see as in competition. The reasons for this lie with the conclusions of the argument of the previous chapter. If the EM thesis is correct then there would be extra neural hard-wiring which realises specific informational processes. Alternatively, if the BM thesis is right then there would just be extra neural hardwiring. But this would not tell us anything about the information processing capabilities of the rest of the brain. The additional neural hard-wiring would only

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<sup>2</sup> Gray *et al.* 1997: 178-9.

<sup>3</sup> Gray *et al.* 1997: 179-80.

provide one causal factor in the explanation of the particular additional characters of experience synaesthetes enjoy. Significantly it would not include the other factors (arguably the relevant factors to be discussed in the present chapter) which would also be required to explain why the experiences of e.g. coloured hearing have the phenomenal characters they do. On the other hand, if synaesthesia were found to be realised by learnt associations rather than neural hard-wiring, this would not be sufficient to dispose of the necessity of specific neural states as realising states for those associations. The issue they may really want to broach is that of multiple-realisation. But this is not addressed by experiments however carefully designed.<sup>4</sup> None of this is to say that synaesthesia may not inform us about features of conscious experience. In the present section the focus is on what synaesthesia can tell us about the phenomenal character of experience.

Most philosophers accept that some mental states involve representational contents; the preceding chapter was premised on such a view. Most philosophers also believe that perception represents the world to be a certain way: 'Perceptual experience represents a particular environment of the perceiver. Normally, a perceiver uses this representation as his or her representation of the environment. [...] This representation is used as the perceiver's belief about the environment'.<sup>5</sup> Some philosophers claim, more contentiously, that all mental facts are representational facts, hence even perceptual experience is to be explained in terms of how it represents the properties of things to be. As Dretske puts it: 'If, in accordance with the Representational Thesis, we think of all mental facts as representational facts, the quality of experience, how things seem to us at the sensory level, is constituted by the properties things are represented as having. My experience of an object is the totality of ways that object appears to me, and the way an object appears to me is the way my senses represent it.'<sup>6</sup>

Theories dealing with the phenomenal character of experience have tended to

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<sup>4</sup> Even if experiments could show that specific neural states were required for conscious experiences it is implausible to think that the brute correlation would do much to explain how those states actually caused conscious experience.

<sup>5</sup> Harman 1990, reprinted 1999: 258.

<sup>6</sup> Dretske 1995: 1.

polarise about two positions. Ned Block claims that 'the greatest chasm in the philosophy of mind - maybe even all of philosophy - divides two perspectives on consciousness'.<sup>7</sup> The two perspectives are divided on one central issue. They differ on 'whether there is anything in the phenomenal character of experience that goes beyond the intentional, the cognitive and the functional'. One can appreciate the importance of the issue by seeing how it connects with the issue of consciousness, which has itself occupied much attention in recent philosophy of mind. Progress on the issue of consciousness, specifically on the issue of why and how we have conscious experience, depends on the resolution of the issue of how the content of conscious experience is itself constituted. (It makes little sense to think there could be conscious experience without there being a content to the conscious experience.) If conscious experience is constituted by some property, which goes beyond 'the intentional, the cognitive and the functional', then any theory of why and how we have conscious experience must accommodate that fact.

Block adopts the term 'qualia' as a convenient terminological handle on the dispute: 'Those who think that the phenomenal character of conscious experience go beyond the intentional, the cognitive and the functional are said to believe in qualitative properties of conscious experience, or qualia for short'. This is a distinct usage; some philosophers use the term 'qualia' in a more general way to talk of the phenomenal character of experience. Few philosophers deny that experience has a phenomenal character. On that usage few philosophers deny that there are qualia.<sup>8</sup> Many more philosophers deny that experience involves qualia in the way Block defines the term. Block's specific usage of the term 'qualia' is the one to be followed here. Block himself accepts the existence of qualia and therefore denies that representational content is all there is to the phenomenal character of experience. Following Block I shall sometimes refer to those who hold a similar view 'phenomenists'.<sup>9</sup>

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<sup>7</sup> Block forthcoming.

<sup>8</sup> If one construes the term 'qualia' this way then one would want to distinguish between qualia realists and qualia irrealists.

<sup>9</sup> Some philosophers might postulate sense-data when relatedly defined as subjective objects of experience (particulars). I shall focus on subjective properties (universals) rather than subjective

The previous chapter argued for broadly externalist considerations about the nature of synaesthesia by arguing that the modularity hypothesis should be construed in terms of teleofunctional properties. Many philosophers opt for a related externalist explanation for the phenomenal character of perceptual experience. Such externalists argue that the local physical states of the subject's perceptual systems are the vehicles of perceptual experience they are because they have evolved to represent properties of objects external to them. Furthermore, such externalists argue that, although the local physical states of the subject's perceptual systems are the vehicles of perceptual experience, the distinctive phenomenal characters of perceptual experiences are dependent for their constitution upon states beyond the local physical states of the subject's perceptual systems. The local physical states of our perceptual systems may represent certain external properties of objects, but it is nevertheless the properties represented that determine the phenomenal character of experience. I shall refer to the view that the phenomenal character of experience is constituted (and exhaustively explained) in this way by the properties objects are represented as having 'externalist representationism' (ER for short). For advocates of ER or (ER-ists for short) the phenomenal character of experience of the bell chiming is exhaustively explained by the properties the bell is represented as having.

ER is not the only possible explanation of the phenomenal character of experience, which adverts to the phenomenal properties of objects. Some philosophers argue that the distinctive phenomenal characters of perceptual experiences are to be exhaustively accounted for by the properties objects present to percipients. I shall call this view 'presentationism' or 'EP' for short. For the EP-ist the phenomenal character of experience of the bell chiming is constituted by properties of the object, which the object presents when it is heard. The difference between ER and EP is most clearly seen, as will become apparent in 3.6, in their treatment of non-veridical experience.

For phenomenists, in contrast with ER-ists, there is a need to postulate

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objects here. If the subjective property theory can be challenged then it makes it all the more likely that the subjective sense-data theory be challenged. The differences are largely domestic issues for an anti-representationist point of view. The sense-data view will be further touched on later in relation to synaesthesia and adverbialism.

intrinsic properties of experience, which supervene on local physical states of the percipient, so-called 'qualia', to account for the individuation of the character of perceptual experience. It is for this reason that phenomenists can be classified as 'internalists' with respect to the issue of the constitutive properties of the phenomenal character of experience. It is because of certain qualia that our experiences of the sounds of bells are like they are and it is because of other qualia that our visual experiences of bells are like they are.

One way, which is typically used to explain qualia, is by analogy, but this might not be the best way.<sup>10</sup> We might compare our visual experience of the world with a photograph. A photograph represents the world in virtue of the causal relationship between some of its properties and the properties of the world it is representing. Presumably our visual experience of the world also represents the world in virtue of the causal relationship between some of the properties of our visual systems and the properties of the world our visual systems are representing. Suppose we compare our visual experience of a bell with a photograph of the bell. There are properties of the photograph, which are clearly distinct from the properties of the bell, in particular, there are the coloured pigments of the photographic paper. In order to reproduce the phenomenal properties of the bell the photograph utilises its own phenomenal properties. The phenomenist argues that mental representations are like non-mental representations in this respect; they too require local vehicles of representation, which themselves have qualitative properties, in order to represent the properties of distal objects of perception. In Ned Block's terminology, there is *mental ink*. As such, for phenomenists, the medium of mental representation is opaque. By contrast, according to ER-ists, the medium of mental representation is transparent. What would be a related representation of our auditory experience of the original sound of the bell? Perhaps a digital recording of the sound of the bell. A digital recording represents the world in virtue of the causal relationship between some of its properties and the properties of the world it is representing. It is not nearly so clear (and I take it that we are considering the highest quality of digital replication) that

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<sup>10</sup> See for example Wager 1999, and Martin forthcoming.

there is an opaque local vehicle of representation for the representation of the phenomenal properties of the original sound of the bell: the replicated sound is better construed as the same type of sound as the original sound. But if this is so then why not also construe the photograph as having the same type of visible properties as the bell? Since any intrinsic properties our visual experiences might have (i.e. qualia) are surely not also visible properties the analogy collapses. One might try to press the difference between a photograph and a recording thus: properties of a metal disk can constitute a representation of properties of sound, but a photograph has phenomenal properties similar to those it represents. The thought would be that we can only know that a metal disk is a representation of a sound when we have the facilities to play it, but a photograph displays its representational properties openly. In response it might be pointed out that we only appreciate that a photograph is a representation because most of us have the requisite optical equipment. The different ways photographs and recordings become representations for us neither help motivate nor help explain the existence of qualia. Qualia can only be introduced on more substantial grounds.

Dretske above presents an identity claim: 'My experience of an object is the totality of ways that object appears to me, and the way an object appears to me is the way my senses represent it'. Tye also advocates an identity claim. His own representationist theory of phenomenal character has the acronym PANIC. The acronym and the implications of the identity claim are summarised in the following passage:

The PANIC theory of phenomenal character: phenomenal character is one and the same as Poised Abstract Nonconceptual Intentional Content [...] It follows that representations that differ in their PANICs differ in their phenomenal character, and representations that are alike with respect to their PANICs are alike in their phenomenal character.<sup>11</sup>

According to Tye phenomenal character is representational content, which is appropriately 'poised' to make an impact on the belief/desire system. Cognitive processes can be broadly divided into two: modular processes which generate representational contents 'in a mechanical fashion by computational processes' and

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<sup>11</sup> Tye 1995: 137-8.

processes of the belief/desire system which operate on the contents provided by modular processes by using concepts. Conscious perceptual experience requires both: the output of modular processes must be subsumed under concepts for conscious perceptual experience. Tye and other ER-ists acknowledge the difference between experiences and other mental states. The difference is not to be explained by rejecting the representational nature of experiential states but by explaining what makes experiential states distinct: the states underlying central processes are digital, whereas the states underlying perceptual experiences are analogue.<sup>12</sup> Poised content is also 'abstract' in so far as no particular concrete objects enter into the representation; different objects can appear exactly similar.<sup>13</sup> It is 'nonconceptual' in that the subject does not require matching concepts; we can discriminate more shades of colour than we have concepts for in our higher processing cognitive systems.<sup>14</sup>

In order to challenge the identity claim it has to be shown either that the one phenomenal character of experience can be related to distinct representational contents or the one representational content can be related to distinct phenomenal characters. The relationship between representational content and phenomenal character is sometimes characterised by a weaker supervenience claim. Supervenience claims permit multiple-realisation: one type of character of experience can be realised by different types of representational states. What is prohibited by a supervenience claim is that different types of phenomenal characters of experience are realised by the same type of representational state. Since it only takes a single counterexample in which representational states are relevantly alike with respect to their representational content but unlike with respect to their phenomenal character to undermine the representationist position (and at the same time show that there are qualia), phenomenists have invested considerable effort in looking for that

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<sup>12</sup> Tye 1995: 100-5. Dretske 1995: 22 says: 'sensory systems have phylogenetic functions and are therefore comparatively modular in Fodor's sense'. These are to be contrasted with conceptual representations, such as thoughts, judgements and beliefs which are indicator functions acquired by the individual that can further group nonconceptual representations according to different uses.

<sup>13</sup> This view can be compared with what Fodor says of the depth of the shallow outputs of modules.

<sup>14</sup> In this respect EP-ists will disagree with ER-ists: there are no nonconceptual representations. EP-ists might explain the discriminations perceivers make between shades of colours in terms of demonstrative concepts.

counterexample.

The next section clarifies the rationale behind ER by describing some of the counterexamples to the theories, which preceded it. It will also outline how ER can respond to the thought experiments, which have been devised to cast doubt on its own credibility. The question of what it is like to be a synaesthete is considered in section 3.3. I discuss the motivation behind the extra qualia argument suggested by synaesthesia, and also its development by Wager, in section 3.4. A response to the claim that the extra phenomenal character of synaesthetic experience cannot be explained in ways consistent with the responses outlined in the next section is given in 3.5. Section 3.6 discusses an alternative response, that given by EP.

### *3.2 A Real Test for Theories of Phenomenal Character*

As Block notes although the debates about qualia have recently become more focused ‘on the notion of representation [...] issues about functionalism [are] always in the background’. It used to be granted by many that types of psychological states should be identified with functional state types. These functional state types would be realised by neural states in human beings, but they could be realised by other kinds of physical states in other kinds of beings. One particular difficulty with the type identification of psychological states with functional state types is that it does not seem able to explain the phenomenal character of experience. In particular it is prone to the challenges raised by two thought experiments: the absent qualia argument and the inverted spectrum argument.

The absent qualia argument is driven by the following thought experiment. Consider the possibility of two subjects,  $S_1$  and  $S_2$ , who are by hypothesis in exactly the same type of functional states (defined as the states relating input stimuli and behavioural output) but  $S_1$  is a human being and  $S_2$  is a robot. According to some phenomenists it is possible for  $S_1$  to undergo normal perceptual experiences whereas  $S_2$  has no such experiences. In this case it is possible for  $S_1$  and  $S_2$  to be in the same functional states and yet have different phenomenal characters of experience:

functionalism does not provide an adequate explanation for the phenomenal character of experience.

Although the inference is valid the soundness of the argument is contestable. Shoemaker, for instance, argues that an account of what it is for mental states to have phenomenal character will require an account of what it is for one mental state to be in greater or lesser degrees similar in qualitative character to another mental state: 'A creature functionally just like a creature having qualitative states would itself have to have qualitative states, for it would have to have states standing in relations of qualitative similarity and difference to one another that are isomorphic with the relations of qualitative similarity and difference holding between the states of the creature that is its functional duplicate'.<sup>15</sup>

According to Shoemaker an account of qualia in terms of local functional states can be given which responds to the absent qualia hypothesis, but, as he also claims, this does not require that individual qualia are functionally definable. For such a functional duplicate could be in the same relations of qualitative similarity and difference even if her qualia were inverted. So one might still have to countenance qualia in virtue of the possibility of inverted spectra. Shoemaker endorses a functional account of the phenomenal character of experience, although this would not constitute an exhaustive account of the phenomenal character of experience, for he maintains that we must postulate qualia to accommodate the possibility of inverted spectra.<sup>16</sup>

The inverted spectrum hypothesis if valid would refute the type identification functionalism seeks in so far as two subjects the same with respect to their functional states would be different with respect to the phenomenal characters of their experiences. Harman states the challenge provided by the inverted spectra argument

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<sup>15</sup> Shoemaker 1991, reprinted 1996: 121-2.

<sup>16</sup> See also Shoemaker 1982 and 1994. Discussion of the absent qualia argument can be found in Block 1980, Kirk 1994 and Tye 1995. The absent qualia argument should be distinguished from the zombie argument, such as is discussed in Kirk 1973, 1994 and 1999 and Chalmers 1996. The latter claims that  $S_1$  and  $S_2$  can be in similar microphysical states and yet  $S_1$  can have experiences whilst  $S_2$  does not. The absent qualia argument is usually taken to constitute a challenge to functionalism, the zombie argument is usually taken to constitute a challenge to physicalism. Whereas the absent qualia argument need not be a challenge to physicalism, the zombie argument would also constitute a challenge to functionalism.

thus: 'It is conceivable that two people should have similarly functioning visual systems despite the fact that things that look red to one person look green to the other, and things that look yellow to the first person look blue to the second, and so forth'.<sup>17</sup> If this is true then 'an important aspect of a person's mental life cannot be explicated in purely functional terms'. It is difficult to set the argument up in a way which does not beg the question, but the supposition phenomenists make (and functionalists should grant) is that how things look depend on local brain states and the two individuals under consideration are inverted with respect to the local brain states which are causally related to red and green things upstream and to speech outputs about red and green things downstream. Consider Tilly and Annie. For Tilly red things cause neurons of type x to fire and green things cause neurons of type y to fire. When type x neurons fire they in turn bring about neural states which cause Tilly to talk about red things and when type y neurons fire they in turn bring about neural states which cause Tilly to talk about green things. However for Annie red things cause neurons of type y to fire and green things cause neurons of type x to fire. But when type y neurons fire they in turn bring about neural states, which cause Annie to talk about red things, and when type x neurons fire they in turn bring about neural states which cause Annie to talk about green things. Thus Tilly and Annie seem to have the same functional states when these are construed as relating input stimuli and behavioural output, but by hypothesis they are inverted with respect to the phenomenal character of their experiences. Harman deals with the challenge by reminding us that perceptual experiences naturally give rise to beliefs, which in turn guide our actions. Since by hypothesis everything is functioning in Tilly and Annie 'in the normal way', in particular how things look to them gives rise to beliefs about how things look to them, they must have different beliefs about how things look to them. This would be enough to constitute a functional difference between them. Furthermore Tilly and Annie must mean something different when they express their beliefs about the colour of objects: when they both express their beliefs about a strawberry by saying 'it is red' and their beliefs about grass by saying 'it is green' they

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<sup>17</sup> Harman 1990, reprinted 1999: 257-8.

must 'mean something different by their colour words'. For functionalists this too would constitute a functional difference. The upshot is that if two people could be inverted with respect to the phenomenal character of their experiences owing to differences in brain wiring they would also have to be in different functional states.<sup>18</sup>

In order to evade the problems raised against the intersubjective inversion argument some philosophers have advocated the possibility of intrasubjective inversion.<sup>19</sup> The intrasubjective spectrum inversion argument supposes that someone, let us say Simon, has experiences having a certain phenomenal character at  $t_1$ . At  $t_2$  Simon's nerves are so altered that the phenomenal character of his experience is inverted. At  $t_3$  Simon comes to function in the same way as he did at  $t_1$  before his nerves were altered. By  $t_4$  he has forgotten that the phenomenal character of his experiences are inverted. Therefore Simon could be in a similar functional state at  $t_4$  as he was at  $t_1$  and yet the phenomenal character of his experience at  $t_4$  would be inverted with respect to the phenomenal character of his experiences at  $t_1$ . Objections have been made to each of these steps: it is not clear that nerves could be so altered that the experiences would be inverted; it is not clear that Simon could come to function in the way that he did at  $t_1$  unless the phenomenal character of his experiences reverted to how they were; and it is not clear that he could forget that these experiences were inverted.

The functionalist explains differences in phenomenal character of experience in terms of differences in functional states which are themselves construed in terms of the causal relations between other mental states (beliefs, desires etc.). The difference between the phenomenal characters enabled in seeing red and seeing green objects may be explained, for instance, in terms of the different beliefs and desires of the perceiver. Such a view could also be considered a representationist view. Someone who held such a view of functionalism could reject the view that the phenomenal

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<sup>18</sup> This is one standard tactic for functionalists: to resist the inverted spectra argument by pointing out some functional difference between subjects which had not been considered in the argument. Recent incarnations of the inverted spectrum argument can be found in Block & Fodor 1972, Block 1980, Shoemaker 1982, 1990 & 1991, Kirk 1995, Tye 1995 and Dretske 1995.

<sup>19</sup> Lycan 1973 introduces nerve switching intrasubjective inversion and Shoemaker 1982 develops the idea.

character of experience is constituted by phenomenal properties of objects. All they would have to hold is that the phenomenal character of experience is its narrow intentional content, that is to say intentional content that is 'in the head'. Creatures, which were the same with respect to their local brain states, would be in the same representational states. We could call such representationism 'internalist representationism'. Such representationists would also resist the view that the phenomenal character of experience is constituted by qualia. The problem with identifying the phenomenal character of experience with narrow intentional content is that one is committed to finding a difference in function whenever there is a difference in phenomenal character of experience. Block has argued that it is not difficult to come up with a case in which there is no difference with respect to function but there is plausibly some difference with respect to phenomenal character. He asks us to consider a child named 'Eliza' raised in a room in which all coloured surfaces are changed every few minutes. She will have 'no associations or behavioural inclinations or dispositions towards red that are any different from her associations or inclinations or dispositions towards blue' but will still plausibly experience different colours.<sup>20</sup> He admits that whether the child has any functional differences (e.g. she responds innately to red and blue in different ways) is actually an open empirical question, but that there are possible scenarios where these asymmetries could be 'ironed out'.

This objection and all of the above objections could be accounted for if one were to postulate qualia. That is the point of the thought experiments. But they can also be explained by ER. The view has been labelled 'wide functionalism'.<sup>21</sup> ER-ists accept the view that the brain realises functional states. But they are not committed to the view that differences in phenomenal character have to be exhaustively explained in terms of local functional differences; they must at least partly be explained by differences in the properties of objects represented. The ER-ist will respond to the thought experiment in the preceding paragraph by saying that the phenomenal character of Eliza's experience is constituted not only by the functional states (construed as relations between local states) but by the changing colours of the

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<sup>20</sup> Block forthcoming.

<sup>21</sup> Harman 1988.

objects which it is the function of the brain to represent.

One spur to the development of ER has been the objections raised by the thought experiments outlined in the preceding paragraphs. Although the functionalist can in many cases provide responses to the objections ER, so it is claimed, can provide responses to all of them. It can provide an answer to the most recent thought experiment outlined above which troubled the functionalist. The distinction between ER and functionalism can also be seen in the way the former responds to the other thought experiments. Functionalism presupposes that physical duplicates are functional duplicates and, both functional duplicates and physical duplicates have the same type of characters of experiences. ER by contrast claims that it is possible for physical duplicates to instantiate different representational states and therefore to enjoy different types of characters of experiences. Two creatures having identical physical states could be in different representational states if their functional states are construed 'widely'. To see how this response works, consider Dretske's reply to the absent qualia argument. Dretske claims that absent qualia are possible; we only believe that a physical duplicate constituted by a freak accident would have the same type of characters of experiences as we do because we ignore the fact that 'the resemblance in both appearance and placement is (by hypothesis) completely fortuitous'. He calls this the 'Paley Syndrome', for the reason that we sometimes illicitly infer function from superficial resemblances. But according to Dretske we should only attribute sameness of function when we know there is a sameness in design or purpose. Whether physical duplicates have the same type of characters of experience depends on whether they have the same evolutionary histories.<sup>22</sup>

Tye also argues that whilst absent qualia would be a threat to functionalism they would be one of the consequences of ER. He responds in a similar way to Dretske; 'if the thesis that the phenomenal supervenes on the neural is false: it is metaphysically possible for microphysical duplicates to differ phenomenally'.<sup>23</sup> The example Tye offers is of physical duplicates (primitive creatures) living on different planets. The first has sensory organs, which could respond to a variety of types of

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<sup>22</sup> Dretske 1995: 141-51.

<sup>23</sup> Tye 1995: 194.

stimuli if they were present in the environment, but happens to respond to only one type of stimuli because that is the only appropriate stimulus available in the environment. These other possible stimuli are present in the environment of its physical duplicate, and it does respond to them. But the second creature will not enjoy phenomenal characters of experience because the brain states it is in will not be causally related to a single type of feature in the environment. The idea is that causal covariations between states of creatures and properties of objects will constitute states of the creature having determinate phenomenal characters only if optimal conditions obtain. Optimal conditions will obtain if the causal covariation is one-one; they will not obtain if the causal covariation is one-many. Although ‘zombies are possible [...] zombie replicas with identical causal histories and identical environments are not’.<sup>24</sup>

ER responds to the inverted spectra argument in a related way: it is possible for physical duplicates to realise different characters of experience.<sup>25</sup> Note in this scenario the possibility of inverted spectra is explained without presupposing the supervenience of character on local brain states. Inverted spectra are possible if ‘the evolutionary histories and natural habitats of the two creatures are different, and the brain states that realise sensations in the first creature are causally correlated with different features from those the same brain states are causally correlated with in the second creature’. Here ‘maximal functional identity’ is lacking.<sup>26</sup> Dretske also believes that two creatures might be indistinguishable with respect to their discriminatory behaviour, and thus their functional states, and yet things might appear differently to the two creatures. The differences are explained by reference to the different properties of objects both creatures represent.

Block accepts that the inverted spectrum argument may not provide the required motivation for the phenomenist position. Therefore he has extended the argument in the form of the Inverted Earth argument.<sup>27</sup> Inverted Earth is a place where the colours of things are exactly reversed; the sky is yellow and grass is red. It

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<sup>24</sup> Tye 1995: 195.

<sup>25</sup> Tye 1995: 201-6.

<sup>26</sup> Tye 1995: 205.

<sup>27</sup> See Block 1990.

is also a place where the names of things are reversed; the yellow sky is called 'blue' and the red grass is called 'green'. The consequence of this is that people on Inverted Earth will call the yellow sky 'blue' and the red grass 'green'. Interesting physical duplicates can be generated if we take one of a pair of twins on Earth, fit them with inverters (and change his body pigments) and transport him to Inverted Earth. He would experience the yellow sky on Inverted Earth as he would were he looking at the blue sky on Earth and call it 'blue' and he would experience the red grass as he would were he looking at the green grass on Earth and call it 'green'. In having such experiences, so the argument goes, the twins would be in the same microphysical states, enjoy qualitatively identical characters of experience, and be disposed to utter the same words. In other words the duplicates would have the same holistic brain states, but they would be functionally different. Put to the test they would pick out different colour samples: one would pick out a blue colour sample and the other would pick out a yellow colour sample. And they would have different representational states in virtue of the difference in colour of the sky and the grass on the two planets, which is assumed to individuate representational content.

The upshot is the converse of the inverted spectrum argument: in the inverted spectrum argument we are supposed to have the same functional state accompanied by different phenomenal characters, in the inverted Earth argument we are supposed to have the same phenomenal characters accompanied by different functional and representational states. But this would be no problem for ER-ists, such as Tye, who admits that it is possible to have two states different with respect to wide functional role and yet qualitatively identical with respect to the phenomenal character of experience. The physical or narrow functional state of the transported twin, which is associated with the phenomenal character of blue, may track yellow but it does not represent yellowness on Inverted Earth because the presence of inverting lenses precludes the constitutive causal covariation between the relevant brain state and the appropriate environmental features.

In each of these cases the representationist has a response. Thought experiments trade on differing intuitions about supervenience. Indeed the arguments

are built around these intuitions: 'I confess to myself feeling the pull of the Internalist Intuition. Indeed, I would not have thought to question it but for the fact that unless it is challenged, an even more (for me) obvious fact must be rejected - the idea, namely, that what goes on in the mind [...] are nowhere to be found in the head'.<sup>28</sup> We may well be better off considering real examples. But these seem equally contentious.

Peacocke has argued that if two trees of the same size are viewed when one is twice as close as the other the visual experience will represent the trees as the same size although one will occupy more of the viewer's visual field. As Tye has pointed out, it is not obvious that phenomenal character does outrun representational content because in this case (and others like it), although the two objects are being represented as being of the same size they are also being represented as being of different apparent sizes because they are also represented with respect to their positions relative to the perceiver.<sup>29</sup>

This is the point at which synaesthesia reappears. Wager has recently claimed that synaesthesia offers a different type of argument against ER.<sup>30</sup> Synaesthesia is of interest because it offers a test to theories of the phenomenal mind by means of a real case, yet it is, at the same time, more akin to the thought experiments concerning unusual phenomenal character.

### *3.3 What Is It Like to Be a Synaesthete?*

Before outlining the way in which the test synaesthesia offers theories of phenomenal character might be turned into an argument for qualia, a preliminary question should be addressed: what is it like to be a synaesthete? In other words, before considering the metaphysical aspects of what it is like to be a synaesthete, the epistemological issue of knowing what it is like to be synaesthetic needs to be broached. Two problems immediately arise.

The first problem is that there are many forms of synaesthesia; even coloured

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<sup>28</sup> Dretske 1995: 151.

<sup>29</sup> Peacocke 1983: chapter 1 and, in response, Tye 1995: 155-9.

<sup>30</sup> Wager 1999.

hearing, the most common form of synaesthesia, has a number of varieties and there are further variations within these varieties. So there is not a single answer to the question of knowing what it is like to be a synaesthete. Despite this problem some general questions, which have a bearing on the metaphysical issue of the phenomenal character of synaesthetic experience, can be isolated.

The second problem is a particular instance of a general problem: one cannot know what it is like to undergo an experience unless one has undergone a similar experience. No doubt for reasons made familiar by Nagel there are limits to the knowledge non-synaesthetes can have of what it is like to be a synaesthete.<sup>31</sup> The point is that only fellow synaesthetes who have undergone similar experiences, and perhaps their experiences are not that similar anyway, can understand what it is like to be synaesthetic. Nevertheless, even if this problem remains, the general questions alluded to in the previous paragraph can be used to try to reach some understanding of what it is like to be a synaesthete.

Let us start with a third-hand account of the phenomenal character of synaesthetic experience. It is drawn from a celebrated study conducted by Luria on subject S:

Presented with a tone pitched at 30 hertz and having an amplitude of 100 decibels, S stated that at first he saw a strip of 12-15 centimetres in width the colour of old, tarnished silver. Gradually this strip narrowed and seemed to recede; then it was converted into an object that glistened like steel. Then the tone took on a colour one associates with twilight, the sound continuing to dazzle because of the silvery gleam it shed.

Presented with a tone pitched at 50 hertz and an amplitude of 100 decibels, S saw a brown strip against a dark background that had red, tongue-like edges. The sense of taste he experienced was like that of sweet and sour borscht, a sensation that gripped his entire tongue.

Presented with a tone pitched at 100 hertz and having an amplitude of 86 decibels, he saw a wide strip that appeared to have a reddish- orange hue in the centre; from the centre outwards the brightness faded with light gradations so that the edges of the strip appeared pink.

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<sup>31</sup> Nagel 1974 argues that we can only know what it is like to be another subject of experience if we have undergone relevantly similar experiences. But for reasons given in response to Jackson 1982 it is arguable whether this has any metaphysical consequences. See Lewis 1986, Loar 1990, Tye 1995 and Sturgeon 1997.

Presented with a tone pitched at 250 hertz and having an amplitude of 64 decibels, S saw a velvet chord with fibres jutting out on all sides. The chord was tinged with a delicate, pleasant pink-orange hue.

Presented with a tone pitched at 500 hertz and having an amplitude of 100 decibels, he saw a streak of lightning splitting the heavens in two. When the intensity of the sound was lowered to 74 decibels, he saw a dense orange colour which made him feel as though a needle had been thrust into his spine. Gradually this sensation diminished.

Presented with a tone pitched at 2000 hertz and having an amplitude of 113 decibels, S said: 'It looks something like fireworks tinged with a pink-red hue. The strip of colour feels rough and unpleasant, and it has an ugly taste - rather like that of briny pickle ... You could put your hand on this.'

Presented with a tone pitched at 3000 hertz and having an amplitude of 128 decibels, he saw a whisk broom that was of a fiery colour, while the rod attached to the whisks seemed to be scattering off into fiery points.

The experiments were repeated during several days and invariably the same stimuli produced identical experiences.<sup>32</sup>

It might be argued that synaesthetes' do not really experience that which they ascribe to themselves. Synaesthetes' experiences not only clash with those of the majority of other perceivers, they also clash with each other's experiences: whereas a sound is reported as evoking a red colour for one synaesthete it might evoke a silver colour for another synaesthete. (It is not as if synaesthetes might all have access to the same reality - a reality which normal subjects do not have access to.) Why should their testimony be believed?

As discussed in the first chapter there are three things, which support the truthfulness of synaesthetes' testimony. Firstly, the evidence from brain scans shows that additional brain areas are activated in synaesthetic experience. The areas of the brain additionally activated in coloured hearing synaesthesia are typically those that are normally activated when subjects are processing representations of visible properties, supporting the view that the synaesthetic experiences produced by auditory stimuli are indeed of colour.<sup>33</sup> Secondly, experiments carried out by Baron-Cohen *et al.* show that synaesthetes' reports of the colours different sounds of words enable are significantly more consistent over time than those of non-synaesthetes who are asked to associate the sound of words with particular colours.<sup>34</sup> And thirdly,

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<sup>32</sup> Luria 1968: 24.

<sup>33</sup> See Paulesu *et al.* 1995, also chapters one and two.

<sup>34</sup> See Baron-Cohen *et al.* 1993, also chapter one and two.

genetics studies indicate a genetic component for synaesthesia. Although this does not directly corroborate the reports of synaesthetes (the genetic component might be responsible in another way for their reports; it might make them all inveterate liars in this respect), given the two other sources of evidence there is good reason to think that synaesthesia is a genuine and distinctive phenomenon.<sup>35</sup>

Even if we take this report at face value it does not tell us exactly what it is like to be a synaesthete. Johnston in a discussion of Scriabin who, it is sometimes claimed, was synaesthetic suggests two possibilities concerning what it was like to be Scriabin. Scriabin supposedly experienced colours in response to hearing sounds. According to Johnston one might consider: 'whether the visual experiences he had when he heard B-flat presented themselves as revelations of the nature of B-flat, a nature missed by all great musicians except Scriabin, or whether these experiences simply seemed to Scriabin to be the 'visual signatures' of B-flat'.<sup>36</sup>

It might be that the difference between these two possibilities will have depended upon what Scriabin thought about his experiences. If he thought that these experiences simply seemed to be additional experiences enabled by B-flat then he would have perceived them as presenting themselves such. That is to say what it is like to be synaesthetic would to some extent be determined by the way synaesthetic experiences are understood. No one, least of all ER-ists, deny the role of concepts in determining the appearance of the character of experience.

But this does not answer the question: which way would a synaesthete regard their experiences? A different, and perhaps better, way of putting the previous question is to ask whether these experiences would have seemed veridical to S. We can use the evidence of one sense to corroborate what is perceived through another sense. We can look to see if something we think we hear is really there. Such cross-modal checking is one way in which we might believe what we perceive. Such processes might make one's experiences *seem* veridical (i.e. have the character of veridicality). Could synaesthetic experiences seem veridical in a related way? Synaesthetic experiences might seem veridical in virtue of the consistent relation

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<sup>35</sup> See Baron-Cohen *et al.* 1996 and Bailey & Johnson 1997.

<sup>36</sup> Johnston 1997: footnote 33.

between enabling stimulus and secondary character of experience. An auditory experience could be related to and checked against the synaesthetic experience it enables and vice versa. The duration and intensity of inducing and induced character of experience usually coincide, although sometimes there is not a correlation between enabling stimulus and secondary character of experience with respect to apparent location; for some synaesthetes their secondary characters of experience always appear in the same part, e.g. top left part of their visual fields. Despite these correlations, we might think that synaesthetes would come to suspect the veridicality of their experiences in virtue of the differences between them and their fellow synaesthetes and, more especially, between them and non-synaesthetes. Their experiences might also seem non-veridical because they seem to be derivative; they seem to be derived from the phenomenal character of experience usually enabled via a different sensory modality. This phenomenal character of experience does seem veridical because it seems to be agreed on by all, synaesthetes and non-synaesthetes alike. But, in contrast to the preceding, there is a way in which the apparent veridicality of synaesthetic experience can be supported. Since the character of synaesthetic experience is the same in the relevant respects as the veridical character of visual experience, which cannot be corroborated cross-modally, it might seem just as veridical. In other words, coloured hearing might seem veridical because it involves additional experiences of colour and experiences of colour may seem veridical independently of cross-modal checking, unlike for instance experiences of shape which may seem veridical in virtue of cross-modal checking. Non-synaesthetes might think that synaesthetes' experience would be sure to appear non-veridical to synaesthetes, but non-synaesthetes might be wrong in this.<sup>37</sup>

Of the one aspect of the phenomenal character of synaesthetic experience, the presence of additional characters of experience, synaesthetes are usually clear: 'I enjoy electronic music because it evokes such wonderful shapes and colours in my

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<sup>37</sup> Grossenbacher 1997: 155 points out that colour is the only dimension of vision which is not normally related to the other senses. Interestingly he suggests that 'the very lack of universal correspondence between colour and other modalities may make colour phenomena readily available for concurrent synaesthetic experience (by virtue of underdetermined intermodal neural connectivity)'.

visual perception area'.<sup>38</sup> It seems clear that the synaesthetic subject experiences a colour when sounds are heard in addition to hearing the sound. Similarly in the following: 'When I listen to music I see colored shapes. If I am tired at the end of the day the shapes seem very near. They are always in color. Shiny white isosceles triangles, like long sharp pieces of broken glass. Blue is a sharp color and has lines and angles, green has curves, soft balls, and discs. [...] I feel the space above my eyes is a big screen where this scene is playing'.<sup>39</sup> It is important that there are two elements of experience. If the two discriminable elements of experience enabled by a sound (the experience of the sound and an experience of a colour) were combined into one auditory experience ER would have difficulty explaining this in terms of the properties of objects represented by the percipient. Equally if there were more than two discriminable elements of experience enabled by a sound, perhaps the experience of the sound and of a colour were fused to form a third character of experience, ER would also have difficulty explaining this in terms of the properties of objects represented by the percipient. But neither of these options are described by synaesthetes. In the context of the present discussion it should be easy for non-synaesthetes to understand what it is like to undergo synaesthetic experiences, for all sighted non-synaesthetes know what it is like to see colours and shapes.<sup>40</sup>

Synaesthetes are often less clear when it comes to incorporating the modality of their experience. It is surely this aspect of synaesthetic experience, which puzzles non-synaesthetes. Some remarks recorded by Cytowic describe the difficulty synaesthetes have describing this aspect of their experience. 'It's definitely colors, but I'm not sure that 'seeing' is the most accurate description. I am seeing, but not with my eyes, if that makes sense'.<sup>41</sup> And again: 'It is not a hallucination but it is hard for me to describe. As I look at a page, I see the colors there even though I see the color of the REAL ink that's before me. I know it isn't there for real, but I still can't help

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<sup>38</sup> Cytowic 1989: 32, subject MM.

<sup>39</sup> Cytowic 1989: 35, subject MML.

<sup>40</sup> The way the term experience is used is often confusing. Does synaesthesia involve one experience or two experiences? The confusion would be relieved if the focus was on the phenomenal character of experience: does synaesthesia involve one phenomenal character of experience or two? Judging by most reports the answer to this question is that they have additional characters of experience.

<sup>41</sup> Cytowic 1989: 23, subject RT.

seeing it. There is a sensation that the color is there'.<sup>42</sup> And finally and perhaps most interesting: 'The shapes are not distinct from hearing - they are part of what hearing is ... That's what the sound is; it couldn't possibly be anything else'.<sup>43</sup> Does part of the reason that synaesthetes have difficulty in reporting some aspects of their experience lie in the fact that there is a distinctive phenomenal character which seems to be related to the unusual mode of perception via which the additional character of experience is evoked? One reason for thinking of a synaesthetic experience of colour as being a visual experience would be if it interfered with the synaesthete's visual perception of the world. There is no evidence of this. It is perhaps this lack of interaction with visual experience, combined with the fact that the character of experience seems to be enabled by an auditory stimulus, which gives the subject the impression that their additional synaesthetic experience is not a visual experience and therefore has to be an auditory one.<sup>44</sup> Is it possible that it seems to synaesthetes as though there is also an additional distinctive phenomenal character related to the unusual mode of perception via which the additional character of experience is evoked?

In some respect this is akin to another problem: the problem of the phenomenal character of experience of common sensibles. Is there anything more to the character of experience which arises when touching shapes and seeing shapes than is given by the properties of objects? Mciver Lopes has recently claimed that it is just obvious that 'tactile and visual experiences have distinctive properties through and through. What it is like to see the shape of a cube is different from what it is like to touch the same shape.'<sup>45</sup> Nevertheless he goes on to argue that in order to bolster such intuitions one needs to consider senses other than those used to gather redundant information; we simultaneously use the eyes and the hands to discern the shapes of

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<sup>42</sup> Cytowic 1989: 43, subject MT.

<sup>43</sup> Cytowic 1989: 65, subject DS.

<sup>44</sup> Paulesu 1995 *et al.* claim to have adduced the physiological basis of synaesthetic colour experiences. They believe the functioning of distinct areas of the brain underlying synaesthetic colour experiences explains certain features of those experiences e.g. the ambiguous spatial distribution of colour experiences is explained by the engagement of visual areas where the neurons have a much looser representation of the visual field than in the primary visual cortex.

<sup>45</sup> Mciver Lopes 2000: 346.

objects and 'the sharing of information that takes place between the senses in cases such as this weaves a tangled phenomenological web'. The case he comes up with is a form of echolocation (it is also known as facial vision). Echolocation is used by the blind to navigate the environment, but there is some evidence that the sighted also use it to discern the shape and distance of things. In other words people hear shapes.

The trouble is that Lopes gives us no substantial reasons for thinking that this is a clear case in which the phenomenal character of hearing shapes is different from that of seeing shapes, apart from the agreed one that the latter involves colours and the former involves sounds. It is supposed to be obvious: 'what it is like to hear a round velvety object three meters away is not what it is like to (dimly) see a round, velvety object three meters away'.<sup>46</sup> And he adds, 'Nor, for that matter, is the phenomenal character of an experience of hearing a triangular shape the same as that of touching a triangular shape'.

But there might actually be good reason to think that what it is like to hear shapes is no different from what it is like to see shapes (if one ignores the colours perceived only by vision and the sounds perceived only by hearing). Consider again what it is like to be a bat.<sup>47</sup> Bat echolocation is enabled by mechanical vibrations, which are generated by the bat itself, reflected off the surfaces of objects and then perceived by the bat. In a manner of speaking, a bat hears itself, but it also uses the sounds it makes to detect size, relative velocity and the distance of external objects. The echo that is reflected back by the target carries information, which allows the bat to detect the flutter of a target. The relative velocity of a target is given by the Doppler shift, calculated by subtracting the velocity of the pulse and the echo. The distance is calculated from the delay between original pulse and echo. The size and direction of the target is calculated from the amplitude and direction of the returning echoes. In this latter respect echolocation fulfils typical representational functions of visual systems; when the distance, relative velocity and size of external objects are seen it is the light reflected off the surfaces of objects which enables the visual perception of those properties. Of course, this requires that some objects make

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<sup>46</sup> Mciver Lopes 2000: 348.

<sup>47</sup> Compare also Akins 1993 on the phenomenal character of bat experience as of colours.

themselves and other objects visible by virtue of the light they radiate. Perception of such objects by virtue of the energy they themselves emit more resemble standard cases of hearing. In consideration of the above, echolocation may seem more like a hybrid between the way creatures hear and see. The moral of the story is that the stimulus information of perceptual systems may be equivalent. Different physical intermediaries (lightwaves and soundwaves) are used by different creatures to perceive the same properties of objects (size, distance and movement). There is no reason to think that the phenomenal character of shape when seen and heard is different in the relevant respect.

The reason that there would be no difference in phenomenal character in the relevant sense is that hearing and vision are both distal senses, which overlap in the relevant respects. Touch is a proximal sense (although the blind might use sticks to sense distal objects). The suggestion that the phenomenal character of an experience of hearing a triangular shape is not the same as that enabled by touching a triangular shape seems much more appropriate. But then this is just the same as the suggestion that seeing shapes and touching shapes have characters of experience that cannot be understood with respect to the representational properties of objects.

One might claim that hearing and touch do have different phenomenal characters without endorsing qualia by reference to the way the body, in particular, the different modes of perception, process what is perceived. The mechanics of touch make the perception of shape seem different from the auditory or visual perception of shape.<sup>48</sup> Suppose that there is a difference, which cannot be accounted for in terms of the properties of objects. The difference between seeing shapes and hearing shapes is generated by the different means of perception: on the one hand the use of the visual organs and on the other hand the use of auditory organs. These different kinds of sensory organs represent the world in different ways in virtue of the different ways they function. The representationist who tries to understand differences in the characters of experience in terms of properties objects are represented as having should have no difficulty with this. One reason the senses can be discriminated by

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<sup>48</sup> See Martin 1992. See also Campbell 1995 who argues that there is no difference in phenomenal character which cannot be explained in terms of the properties of objects.

those who have them is because of the way the sensory organs operate: the way we move our eyes about is reflected in the phenomenal character of our visual experience.<sup>49</sup> We experience our visual perception in the way we perceive the world from a point of view. One way we can tell the difference between vision and hearing is that we cannot see out of the back of our heads, whereas we can hear things behind us. The difference is one of how the sensory organs function. ER-ists can hold that creatures represent how they represent the world by representing the way their sensory organs work in perceiving properties of objects. The senses themselves have properties, which are represented by perceivers. The difference between seeing shapes and hearing shapes would be given by the mode in which shapes are perceived: we can only see shapes in front of us, presumably we could hear shapes behind us. Of course these differences between seeing and hearing are only contingent. The differences between touch and the distal perceptual modalities are necessary. But there seems no reason why the representationist should not adopt an explanation of the necessary differences of phenomenal character between distal and proximal senses similar to the explanation they might adopt of the contingent differences of phenomenal character between distal senses.

How does synaesthesia fit into this discussion? What if a colour experience that is enabled by a sound has a phenomenal character that cannot be had by an experience of colour as enabled by light? Suppose an experience of red enabled by the sound of a bell ringing were unlike any possible experience of red that could be enabled by a red object. The thought is that there would then be a character of experience peculiar to colour experiences enabled by sounds, which is not exhaustively accounted for in terms of the properties of objects being represented. Perhaps what it is like to be a synaesthete does involve an extra character of experience given by a particular mode of perception. But if it does this will provide no more of a problem to ER than do properties, which are veridically perceived by different senses. If coloured hearing synaesthesia is to provide a challenge to ER it must be in virtue of the extra colour experience.

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<sup>49</sup> Of course there are probably other cues, such as the feedback from the ocular muscles.

### 3.4 *The Extra Qualia Argument*

A preliminary consideration of synaesthesia certainly suggests a counterexample to representationism. To see why it is helpful to consider again how ER explains the phenomenal character of experience. ER-ists can agree that distinct areas of the brain are responsible for processing distinctive types of stimuli. After all, the evidence seems overwhelming that our visual experiences are dependent upon distinct areas of the occipital cortex, our auditory experiences are dependent upon areas of the temporal cortex, our tactile experiences are dependent upon the somato-sensory cortex and so on. (In the sense that these brain areas may be differently constituted, distinctive perceptual experiences depend upon particular types of brain states.) ER is nevertheless able to explain the distinctive phenomenal character of such experiences by reference to states of affairs external to the percipient. For example, the difference between the phenomenal character of experience of the blind and the sighted may well depend on the difference between local brain states, but, according to the ER-ist, the distinctive phenomenal character of the visual experiences of the sighted can nevertheless only be explained by reference to states of affairs external to the percipient.

In order to press this point ER-ists advert to the so-called *transparency objection*. When we reflect upon our experience the objects that we perceive are not replaced by entities belonging to an inner realm. We are only aware of the properties objects are represented by us as having, not the vehicles of experience. When you look at an object in front of you and then try to introspect on your experience all you do is focus on the visible properties of the object. Or when you listen to something and then try to introspect on your experience all you do is focus on the audible properties of the object.<sup>50</sup>

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<sup>50</sup> The original point was made by Moore: 1922. See Harman 1990, Tye 1995: 134-6 and Dretske 1995: 34-8 for statements of the representationist objection. See Martin forthcoming for use of the transparency objection on behalf of the presentationist

Phenomenists typically argue that phenomenal transparency cannot be used to reject qualia. Some phenomenists claim that introspection alone cannot be used to show that there are no intrinsic properties of experience. Shoemaker claims this much, but also claims that thought experiments can be employed to make us realise the existence of intrinsic qualitative properties of experience.<sup>51</sup> Some phenomenists argue that introspection can actually be used to show that there are qualia. Block argues that the diaphanousness of perceptual experience fades; when we close our eyes in daylight our experiences will not clearly and uncontroversially be about anything. For such experiences there would be nothing which would be transparent to experience.<sup>52</sup>

Synaesthesia seems to offer another challenge to the phenomenal transparency objection. One thought might be that the vehicles of experience, which phenomenists advert to, are apparent to introspection in synaesthetic experiences. When the sound of a bell also produces the experience of a colour it is mental ink which colours the synaesthete's experience.

The challenge of synaesthesia to ER should now be more evident. In normal perception, although different types of experience may be dependent upon distinct types of brain states, the distinctive phenomenal character of such experiences can still be explained by reference to states of affairs external to the percipient. Similarly, when comparing the sighted and the blind, although the difference in experience between them may be dependent upon distinct types of brain states, the phenomenal character of experience of the sighted can nevertheless be explained by reference to states of affairs external to the percipient. But, when comparing the normal percipient and the synaesthete, where the difference in experience between them also seems to depend upon distinct types of brain states, the additional phenomenal character of experience cannot be so obviously explained in terms of external states of affairs. Indeed, there seems nothing there for synaesthetes to represent: the colour produced by the sound of a bell does not represent anything, in particular it does not represent

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<sup>51</sup> See Shoemaker 1994.

<sup>52</sup> Block does not say why our eyelids are not the object of such representations. See also Peacocke 1984 and Boghossian & Velleman 1989, who argue that the intrinsic properties of sensory fields are evident in certain experiences. Whereas Peacocke argues for a dispositionalist account Boghossian & Velleman argue that intrinsic properties of sensory fields support a projectivist account.

the sound of the bell. If the phenomenal character of experience could be additional where external states remain the same then it becomes easier to explain the additional phenomenal character of experience in terms of local physical states and thus extra qualia. If synaesthesia suggests extra qualia then, so the phenomenist might contend, the character of veridical perception is more likely to be constituted by qualia.

Qualia are sometimes denied because it seems incomprehensible how they should come to appear to be properties of objects: how do we explain the way that the colour and the sound of the bell appear to be properties of the bell? Synaesthesia does not provide an answer but it does suggest that there is a projective mechanism. Different forms of synaesthesia show different projections. Some synaesthetes say that their colours are experienced to be 'in the head'. Other synaesthetes say that their colours are experienced to be 'in the world'. This would seem to suggest that there are mental mechanisms for transforming qualitative aspects of experience into representations of objects. This is not to say that ER would not be able to incorporate this feature into their own approach, it is only to say that the notion of intrinsic properties of experience supervenient upon local states is not as implausible as some ER-ists suggest who make the obvious point that you find no qualia in the brain when you look there. One should not expect to.

But the preceding is only suggestive of extra qualia. The suggestion is that the additional non-veridical phenomenal character of experience, which is revealed through introspection and correlated with the additional activity of local brain areas shows that the phenomenal character of synaesthetic experience is wholly dependent on local brain states. In order to turn it into a sound argument it has to be shown that the extra character of experience cannot be explained in terms of representational content, which, in turn, can only be explained by reference to individuating relations with external properties.

Wager claims it can be shown that there are cases in which the extra phenomenal character of experience cannot be explained by reference to representational content. Wager, in common with others, takes the essence of the ER view to be the thought, as expressed previously, that the phenomenal character of

perceptual experience can be fully explained in terms of representational properties, and in particular those experiences that are alike in their representational contents will be alike in their phenomenal characters. Wager claims that synaesthesia provides the counterexample to ER whereby the representational contents of two experiences are the same but the phenomenal characters of the experiences are different.

Wager summarizes the argument in the following way:

In schematic form, the problem of extra qualia is that it is possible for there to be two people, A and B, alike in all respects relevant to theory of representational content T such that experiences via sensory modality M1 produce qualia associated with M1 in both A and B, but produce additional qualia associated with another modality M2 only in B. A and B thus have partially different phenomenal contents without any difference relevant to T.<sup>53</sup>

Wager describes three cases. The first case is that of the average perceiver and a synaesthete; it is supposed to exemplify the way he sets up the extra qualia argument in the above quotation. It concerns two sisters. Cynthia has a form of coloured-hearing synaesthesia; she experiences colour when she hears music: 'as a particular example, suppose that whenever the note Middle C is played, she experiences a six inch high by one inch wide bar of some determinate shade of red in addition to the experience that a non-synaesthete has upon hearing Middle C'.<sup>54</sup> Norma has average perceptual capacities. Since Cynthia and Norma have different experiences (or experiences having different phenomenal characters) the representationist is required to argue that Cynthia and Norma have different representational contents. Wager notes that, if a simple causal covariation version of representationism is assumed, then it appears that Cynthia and Norma do have the same representational contents, for the experiences of both sisters covary with the same external state.

Tye, who endorses a causal covariation theory, is Wager's intended target here. But the theory of representational content Tye endorses is not a simple causal

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<sup>53</sup> Wager 1999: 268-9. Wager entitles his paper the 'Extra Qualia Problem'. By 'qualia' he seems to mean phenomenal character of experience. We can agree that there is extra phenomenal character of experience in synaesthesia and thus extra qualia in this sense. The issue is whether this involves extra qualia as the term is usually construed by phenomenists, that is intrinsic properties of experience that outrun representational content. If it does not there are no extra qualia and no argument for any qualia here in the phenomenist's sense of the term.

<sup>54</sup> Wager 1999: 269.

covariation theory. He claims of a veridical perceptual experience that it represents because the following equation holds:

S (a state of percipient  $x$ ) represents that P = df If optimal conditions obtain, S is tokened in  $x$  iff P and because P.<sup>55</sup>

If optimal conditions were to obtain, it is both necessary and sufficient for P (a state of affairs) to occur for an experience having a distinctive phenomenal character S to be tokened in a percipient  $x$ . This shows how the representational state causally covaries with what is being represented, which also enables that representation. It also suggests how the phenomenal character of perceptual experience is constituted by the phenomenal properties of objects P being represented. If the phenomenal character of experience is constituted by a subject-independent item, then the phenomenal character of experience will be exhausted by its representational content. Whenever the percipient is in state P and optimal conditions do not obtain then misrepresentation occurs. In causal theories of whatever kind it has always been a problem characterising precisely the causal link. Tye leaves the precise specification open. However he does claim that even if a general definition of optimal conditions cannot be given whether optimal conditions are operating can, in practice be decided in particular cases.<sup>56</sup>

Wager himself acknowledges that the claim that the case of Cynthia and Norma refutes Tye's account of representationism is too quick (even without asking whether optimal conditions are met). The longer answer must respond to two issues in particular, which arise in determining the representational content of Cynthia's experience. The first issue is whether the auditory and the additional synaesthetic characters of experience be treated together. If they are not to be treated together then the second issue arises as to whether Cynthia has visually interacted with anything that produced experiences with the same phenomenal character as the secondary synaesthetic experience. If she has then, according to the causal covariation definition of representational content above, this would also contribute to the

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<sup>55</sup> Tye 1995: 101.

<sup>56</sup> Tye 1995: 226 ff. 16.

representational content of the additional character of experience, which is produced in synaesthesia.

But do we need to consider this second issue? That is to say, do the auditory and the additional synaesthetic characters of experience need to be treated separately? If the auditory and the additional synaesthetic characters of experience are to be treated together then it would seem that the ER-ist is indeed stymied, for then we should regard Cynthia and Norma in the above example as both having auditory experiences which are individuated in terms of representational properties by what they causally covary with but which have different phenomenal characters. Whereas Norma will have normal auditory experiences Cynthia's auditory experience will have a different phenomenal character. So we have a case in which the representational content is the same but the phenomenal character is different. Wager adverts to the coloured hearing synaesthete's own reports of the phenomenology of their synaesthetic experiences being inseparable from hearing to argue that the elements should not be treated as separate: 'The shapes are not distinct from hearing - they are part of what hearing is ... That's what the sound is; it couldn't possibly be anything else'.<sup>57</sup> But in a sense just raising the problem of the extra phenomenal character of experience in the way that it has been raised indicates that we do need to treat the auditory and additional synaesthetic characters of experience separately. Synaesthetes are still perfectly able to discriminate the colours they experience from the phenomenal character of the sounds they experience. It is, after all, for this reason that synaesthetes think they are having unusual experiences: no one else seems to experience colours when they hear sounds. The experiences of colour can still be discriminated from the experiences of sounds in presumably the same way that veridical experiences of Middle C and of a red bar can be discriminated (that is to say, regardless of whether one were aware of the causal connections which were or were not enabling them). And one would want to think of the veridical experiences of Middle C and a red bar as having separate elements. If the case is to run Cynthia's synaesthetic experience would have to be an auditory experience the character of

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<sup>57</sup> Subject DS from Cytowic 1989: 65 quoted in Wager 1999: 265.

which was different from Norma's, but at the same time the content of which could not be separated into elements. Only in this way would the synaesthetic experience covary with Middle C but have different phenomenal character. It can be denied in this case.<sup>58</sup>

Of course, the claim is not that the experience of colour in synaesthesia is exactly like any experience of colour the synaesthete has already had. But then it need not be. One claim Wager wants to press is that the unique character of synaesthetic experience (it is unlike the visual experience of red) is damaging to ER: 'If the synaesthetic component of Cynthia's experience has Middle C as its unique trigger, then this only adds additional support to the claim that her experience causally covaries with and therefore represents Middle C'.<sup>59</sup> There is no obvious problem raised for ER in the fact that someone could see a colour they have never experienced before as long as they have the capacity to see it. Similarly there is no obvious problem if the synaesthete experienced colour in a way she has never experienced colour before (or even never could do so visually) as long as she has the additional capacity to do so via extra neural connections. The only difference is that in the first case a causal relation has not yet been instantiated between a state S and a particular colour and in the second case a causal relation has not yet been instantiated between a state S (which covaries with a particular colour) and a sound.

The issue then focuses on how we are to regard the representational content of Cynthia's experience if the auditory and the additional synaesthetic experiences are to be regarded as separate elements. For this we need to advert to the causal covariation which is required to exist between S (a state of percipient x) and P such that S represents that P iff (if optimal conditions obtain), S is tokened in x iff P and because P. As Wager has to acknowledge the counterexample will fail if Cynthia has previously visually experienced red bars. For then whereas Cynthia's auditory experience represents Middle C, her synaesthetic experience represents 'the disjunction red bar or Middle C', since this element of her experience causally

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<sup>58</sup> According to Wager, even if Cynthia had experienced red, the synaesthetic experience would covary with the disjunction Middle C or (Middle C and red), and therefore covary with Middle C alone.

<sup>59</sup> Wager 1999: 271

covaries with Middle C and red bars.<sup>60</sup> In this case although Cynthia and Norma have different characters of experience on hearing Middle C they also have different representational contents.

Wager resorts to the stipulation that Cynthia has never experienced a red bar (and, moreover, never could experience a red bar since she is congenitally blind). This gives Wager his desired counterexample on the simplest causal covariation model. Indeed, as he remarks, if content is assigned in this way then both the simple auditory and the complex synaesthetic experiences will represent Middle C and yet have different phenomenal characters.

But even Tye does not want to recommend the simplest causal covariation model.<sup>61</sup> Even though afterimages may be enabled by just the same, and only the same, stimuli as enable certain veridical experiences of bright lights Tye does not suggest that they represent the properties of lights in the same way. Afterimages are representational, only they systematically misrepresent. This can be explained in that optimal conditions are not met: 'An afterimage is a sensory experience [...] that represents that something is present with a certain two-dimensional shape and colour [...] Since there really is no such item, an afterimage is a misrepresentation: the subject of such an experience is undergoing a sort of illusion. The illusion is created by the abnormal state of the person's sensory apparatus which is induced by the bright light'.

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<sup>60</sup> Wager says that her synaesthetic experience represents the disjunction Middle C or red. This seems wrong if one is assuming a simple causal covariation model. It should be the conjunction Middle C and red.

<sup>61</sup> A causal covariation theory of representational content such as is advocated by Fodor 1990 has to answer the problem of misrepresentation. He claims that there is an asymmetrical causal covariation. It is hard to see how an asymmetrical causal covariation theory would be able to explain such a case of synaesthesia. The covariation of sounds and states representing colours would have to depend asymmetrically on the covariation of colours and states representing colours. But a blind synaesthete seems a possibility, in which case the covariation of sounds and states representing colours would not depend asymmetrically on the causal covariation of colours and states representing colours.

<sup>62</sup> Tye 1995:109. The type of charges Tye is responding to here have been presented by Boghossian & Velleman 1989. Boghossian & Velleman 1989 seem to be arguing that where afterimages might have some representational content when the eyes are open they would not when the eyes are closed. But if our eyelids are represented when we are awake and our eyelids are closed, it is not clear to me that, since we would still be representing the world in such a case, the closing of the eyelids makes little difference in the account one gives of afterimages.

Synaesthesia is surely another occasion where optimal conditions are lacking. Optimal conditions may be difficult to determine in general but it is clear that there is a particular account about the lack of optimal conditions available in the case of synaesthesia. (It should be emphasised that this account is a different one from that which might have to be told about Cynthia's blindness.) The account available for synaesthesia is related to an account Tye has already given. Just as causal covariation does not have accompanying optimal conditions when different types of stimuli causally covary with one type of state *S* (see Tye's discussion of the absent qualia argument), causal covariation does not have accompanying optimal conditions when one type of stimulus causally covaries with different types of representational states. One-many causal covariation is not causal covariation with optimal conditions whichever way it goes.

There is another related way of responding to Wager's move of stipulating that Cynthia never could experience a red bar. It does refer to Cynthia's blindness. This response claims that Wager's move will not work because the phenomenal characters of experiences, including synaesthetic experience, should be understood in terms of the functions of the states underlying them: it is not the function of the states underlying the synaesthetic experience to represent Middle C. The next section summarises the teleological premises of ER and Wager's attempts to challenge them.

### *3.5 Synaesthesia: Representation and Misrepresentation*

Dretske has developed a teleological theory of perceptual experience. Perceptual experiences can only be explained in terms of the evolutionary history of perceptual systems. Dretske advocates that: 'a system, *S*, represents a property, *F*, if and only if *S* has the function of indicating (providing information about) the *F* of a certain domain of objects. The way *S* performs its function (when it performs it) is by occupying different states  $s_1, s_2, \dots, s_n$  corresponding to the different determinate values  $f_1, f_2, \dots, f_n$  of *F*'.<sup>63</sup> The visual and auditory input systems are two such systems.

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<sup>63</sup> Dretske 1995: 2.

Both evolved to represent specific ranges of properties of objects. This version of the representational theory of perceptual experience presupposes causal covariation between the states of the perceptual system and the properties of objects. But whether these causal covariations constitute representational systems depends upon whether they have been selected over evolutionary time.

The view that sensory systems have evolved to represent specific ranges of properties of objects has the following consequence: 'Representations have a sense (the properties they have the function of indicating) and often enough a reference (an object whose properties they represent), but the sense does not determine the reference'. It is for this reason that 'two representations with the same sense can have different referents'.<sup>64</sup> It is also for this reason that sensory systems can misrepresent. Misrepresentation according to Dretske can come about in a number of ways. Each of these ways requires that the system be in a state it was not designed to be in. The state of a perceptual system may constitute a representation of the properties of an object when the object represented has different properties from those it is represented as having: a red object may be misrepresented as orange. And the state of a perceptual system may constitute a representation of the properties of an object when there is no object. If one were to follow Dretske's version of ER it would be the case that, when a sound enables an experience of colour, states of the visual system constitute representations of the properties of a possible object, even though there is no object. It is like the second type of misrepresentation described above. But there is also a difference. In the second type of misrepresentation there is a representation of an object being a certain way even though there is no object. In synaesthesia there is no representation of an object being a certain way, only a representation of certain properties of a domain of objects. But this is not a problem: according to ER it is not the task of sensory systems to represent what any particular object represented is, only to represent properties of a domain of objects and thereby represent or misrepresent the way of the world.

According to evidence from modern imaging techniques, the extra

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<sup>64</sup> Dretske 1995: 23.

phenomenal character of synaesthetic experience occurs when the visual system occupies a state, which it is meant to occupy when it represents a visible property. Therefore the representation should straightforwardly be regarded as a misrepresentation. Blind Cynthia's synaesthetic experience, although reliably enabled by Middle C, does not represent Middle C but red. The auditory and synaesthetic experiences have different phenomenal characters, but then they also have different representational contents.

If the representationist is right about the phenomenal character of experience, then there should be no extra difficulty about the additional phenomenal character of experience. Indeed synaesthesia is a plausible consequence of ER: if there are neural connections between sensory systems (either a breakdown of the barriers between sensory systems or an extra module) there will be extra phenomenal character of experience. It is in fact the actuality of synaesthetic experience - as the admixture of phenomenal character - which indicates that the representationist is on the right track about the phenomenal character of veridical experience.

What has seemed problematic about ER with respect to perceptual experiences is whether it can explain the phenomenal character of experience and, more especially, whether it really can explain false perception. There is a strong intuition that one cannot have an experience of something red, when there is no red object, without there being something red that one experiences. ER-ists argue that this is a false dilemma: representational states do not possess sensible properties, they represent them. Once the representational content of phenomenal character is fixed by properties of domains of objects what constitutes the misrepresentation may be fixed locally. By claiming that the distinctive phenomenal characters of perceptual experiences are dependent for their constitution on states beyond the local physical states of the percipient ER-ists do not claim that the percipient has to be in direct contact with those external states. All that matters is the necessity of those external states at some point in time for the constitution of the phenomenal character of experience. Indeed, according to the teleological theory of representation, it will be the subjects ancestors which would have been in direct contact with those external

states.

In order to sustain the challenge to ER one would have to argue that a synaesthetic experience is a veridical representation. When a sound produces an experience as of red, it is clearly not the case that an object is being represented as red. For then the object might be coloured all over in two different ways. We cannot represent this sensorily.

It makes slightly more sense to say that the sound that the object makes is being represented as red. Perhaps a sound is represented as being coloured? But as Wager notes this tactic would offer the possibility that the phenomenal character of synaesthetic experience might represent the true colour of sounds and another way out for the ER-ist.<sup>65</sup> He likens this to the way that the ER-ist typically explains the difference between seeing shapes and touching shapes: by reference to properties picked out by the different senses, 'colours in the one case and textures in the other case'. Might synaesthesia pick out different properties of Middle C than are picked out by auditory experiences? We can agree that it does not, partly because the majority of people do not purport to hear colours in this way, but more importantly, because, if one advocated ER, the property which constituted the colour of the sounds would turn out to be exactly the same property that constituted the normal auditory experience of Middle C. But this does not mean that another way out is blocked to ER, as Wager suggests, it is another reason to think that what we have in synaesthesia is misrepresentation. Coloured hearing is not hearing colours and not thereby related to seeing colours in the way that seeing and touching shapes are related by the shape of things.

Wager tries to press his challenge to ER by devising two other cases. Case two is designed to challenge the teleological addition to the causal covariation version of ER. Tye acknowledges evolutionary considerations but he also he maintains that creatures with no evolutionary history, like Davidson's *Swampman*, have perceptual experiences because the right sort of causal covariation is in operation.<sup>66</sup> Wager claims all that is required to sustain the challenge against Tye is to consider Cynthia as

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<sup>65</sup> Wager 1999: 273-5.

<sup>66</sup> Davidson 1987 and Tye 1995: 153-4.

a *Swampcreature* (call her 'Blind Swamp Cynthia'). Since the representational content of her experience will not be determined by evolutionary considerations, only by causal covariation, the response cannot be made that she is misrepresenting. Therefore, in case two, there are two individuals, Norma and Blind Swamp Cynthia who have partially different phenomenal contents without any difference relevant to representational content.

Since Wager departs from the spirit of his argument (initially he was looking for a real rather than imaginary counterexample) one might argue that it is significantly weakened. For all that, it seems to me, that Wager's thought experiment does not even work on its own terms. Tye insists that the constitution of phenomenal character by causal covariation with properties of the environment presupposes optimal fitting. Although there might be causal covariation between areas of the brain associated with synaesthetic experiences in the actual world and external properties it is implausible that these covariations would constitute optimal fitting. Remember that causal covariation should not be a one-many relation. There are other areas of the brain (auditory areas in our world) that also causally covary with the auditory signals. Therefore in the case of Blind Swap Cynthia where there is a one-many causal relation optimal conditions are lacking. If one follows the response Tye provides to the absent qualia argument Blind Swamp Cynthia, like the creature whose state S is enabled by a variety of types of stimuli, would not have conscious perceptual experiences after all. If there is no reason to think that Blind Swamp Cynthia would have conscious perceptual experiences there is no reason to think that she would have synaesthetic experiences. So we have no reason to think that there is synaesthetic experience having a representational content given simply by causal covariation.

One might be unsatisfied by this response: surely Blind Swamp Cynthia has conscious perceptual experiences. It is implausible to think that just because she has additional neural connections she cannot be conscious. But even if the constraints on one-many causal relations are relaxed why should Blind Swamp Cynthia have both normal auditory experiences and additional synaesthetic experiences? We might explain the normal auditory experiences by reference to the causal covariation

between states of the auditory cortex and audible properties. (Presumably these are fine-grained causal covariations.) But why should the additional causal connections to other areas of the brain enable experiences of colour? (Ignore the fact that these are probably not so fine-grained causal covariations and therefore do not correlate in a one to one fashion with audible properties.) Because these areas of the brain do enable experiences of colour in the actual world? Or perhaps because these areas of the brain would enable experiences of colour if Blind Swamp Cynthia were sighted? But the phenomenist cannot allude to what would be the case if Swamp Cynthia were sighted because then ER-ists can make the response that Blind Swamp Cynthia's synaesthetic experience has to be understood by reference to her sighted fellow Swamp creatures. And Sighted Swamp Cynthia would not offer a counterexample to ER because her synaesthetic experiences would be constituted by different causal relations from those constituting Norma's auditory experiences. That is precisely why we needed to advert to Blind Swamp Cynthia in the first place. And we cannot allude to the similar visual areas of the brain's of actual synaesthetes because these have to be understood in their own terms, namely in terms of evolutionary functions. ER-ists can then make the response that Blind Swamp Cynthia's synaesthetic experience is illicitly understood by reference to actual blind synaesthetes. So even if Blind Swamp Cynthia has auditory experiences there is no reason that the extra connections in her brain should enable experiences of colours. The only reason we think that they do is because we smuggle in illicit references to sighted Swamp Creatures or normal blind synaesthetes. As a last resort one might advert to the supervenience of phenomenal character on local neural states. But that claim is just what is under discussion here; it would beg the question.<sup>67</sup>

A final challenge might be raised against the teleological version of representationism: could synaesthesia actually have an evolutionary function which

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<sup>67</sup> We might be able to apply evolutionary considerations without having to talk in terms of evolutionary history which by hypothesis we are not allowed to do. We can consider the immediate context of the creature of Blind Swamp Cynthia to determine whether synaesthesia has a function in that context. It seems plausible to think that it is the veridical auditory experiences which confer fitness; synaesthetic experiences confer no additional fitness. Therefore we have no reason to think that synaesthetic experiences would have any function.

then allows two subjects to have partially different phenomenal contents without any difference relevant to representational content? Wager's case three explores this possibility.<sup>68</sup> The imagined world is one in which auditory information is vastly more important than visual information for the purposes of survival. (It might be that we have to suppose that the visual system has been selected for in the past and conditions have since changed.) In this world there is a predator which is practically invisible but makes distinct sounds. Wager suggests that in such a world coloured-hearing synaesthetes would be more likely to take account of auditory stimuli. This is not to deny that non-synaesthetes hear just as well (remember that auditory and synaesthetic components are reliably related), it is only to suggest that synaesthetes will have a more forceful experience. Owing to the forcefulness of their synaesthetic experiences Wager claims that synaesthetes will be fitter than non-synaesthetes and therefore synaesthesia will be selected. A lot is riding on the idea of the forcefulness of the synaesthetic experience, its demand on attentional resources and the diminished likelihood of its being overshadowed by information from other sensory modalities. It might be argued that since auditory experience is now supposed to carry the most information anyway that it is just as likely, that synaesthesia will distract attention from the primary stimulus and thus confer a selective disadvantage. Of course, whether synaesthesia could convey a selectional advantage is an empirical matter. For the sake of argument let us grant that it does. In time the visual system loses any adaptive advantage it has and members of the species gradually lose the power of sight, although they retain the brain mechanisms that process colour representations. Wager maintains that the representational content of synaesthetic experience enabled by Middle C of a member of this species will now be determined by Middle C, but the

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<sup>68</sup> Is a selectional advantage needed to construe representation teleologically? Could synaesthesia be linked to some characteristic that does have a selectional advantage? Wager argues that a selectional advantage is not needed. His argument is that the sense of smell could have been selected without bestowing an adaptive advantage, it being linked to the sense of taste which did, and yet we would not want to deny smell representational content. It is hard to imagine the sense of smell having lacked an adaptive advantage. Indeed, it is by a consideration of the evolution of the senses of smell and taste that one thinks of them as indeed separate senses. So there is no good reason to think that the linkage with a characteristic that does bestow a selectional benefit gives the right kind of explanation for the phenomenal character of synaesthesia to be considered representational (rather than misrepresentational).

phenomenal character of this experience will be different from the experience of the average human percipient listening to Middle C. Therefore ER is false.

But ER will be false only if ER-ists do not have an equally good explanation. If we are to regard the extra character of experience as representing the distal stimulus there seems little reason why ER-ists should not still regard the former as misrepresenting the latter. Just because a misrepresentation is (or has been) advantageous is not sufficient for turning it into a veridical representation. Consider a blind synaesthete who experiences colours when they touch things. They might be able to turn this to their advantage when trying to read Braille.<sup>69</sup> Even if were it agreed that synaesthesia has been selected for in some way this does not mean that we should regard it as representing the distal stimulus. After all, auditory experiences were selected to do that, have always done that and still do that. So it is still not clear that we should regard the representational content of synaesthetic experience any differently from that of the original case of Cynthia.

The discussion of this chapter relates to that of the previous chapter. If one were to follow the suggestion outlined in the previous chapter the constitution of an extra cognitive module would be independent of the constitution of the phenomenal character of experience. It may even be that what presumably is a breakdown in certain properties of modularity should come to subserve an extra module. Suppose it were found that synaesthesia bestowed significant advantages on those who had synaesthetic experiences and for the reason that they had those experiences. Synaesthesia should firstly be construed as an extra module. We have no reason to reconstrue the way the phenomenal character of experience is constituted. If teleological factors were to select synaesthesia they would not redetermine representational contents, they would select a new module. The phenomenal character of synaesthetic experience should still be construed as involving misrepresentation. This is just to be expected if what realises synaesthesia is the connection of existing modules which were selected to represent a certain range of determinable properties.

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<sup>69</sup> Wheeler & Cutsforth 1921a argued that the colours produced on sensing objects by touch could represent properties of objects for a blind person because they were used in an appropriate way. But because Cutsforth's synaesthetic experience had a use did not turn it into a veridical representation.

There are thus already mechanisms, which can allow misrepresentations to contribute to fitness. Selection does not necessarily turn misrepresentations into representations.<sup>70</sup>

If we have to regard the extra character of experience as a veridical representation in order to maintain the challenge to ER, perhaps we might do better construing it as representing not distal stimuli but local brain states? It might be argued that afterimages do not represent properties of possible objects but states of the visual system. After all they are not much like visual experiences; for one thing, it is hard to see what they could be representing, and for another thing, they move with the eye rather than independently of it as other representations do. (Just as ringing in the ear seems to be located in the ear.) This move might then allow us to say something of a similar sort in the case of synaesthetic states. Maybe synaesthetic states should be seen as representing other states of the brain? Wager objects to this way out by arguing that we would then have to construe normal experiences as representing brain states rather than distal stimuli. But there is a crucial difference; whereas normal perceptual systems were selected for because they represented external objects, synaesthesia was originally selected for not because it represented external objects but because it drew the attention of its ancestors to their predators via drawing their attention to their auditory experiences via misrepresentations. What remains of the visual system might better be construed in the way that pain centres might be construed as representing states of the organism. The trouble is that, for reasons given in the preceding paragraph, such representations would still not constitute veridical representations.

In summary, Wager's tripartite argument against the claim that the phenomenal character of experience can be fully explained by representational properties has been met. Contrary to first intuitions synaesthesia does not show that the phenomenal character of synaesthetic experience involves intrinsic qualitative properties of experience. Indeed there is a theory available, the representational theory of the phenomenal mind, which explains the phenomenal character of synaesthetic

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<sup>70</sup> For case three to work an extra module must be constituted which already presupposes intrinsic properties of experience, which is clearly to beg the question against ER.

experience. But is it the only one? For ER the phenomenal character of experience is provided by the representation of phenomenal properties. Therefore experience is not fully relational, but quasi-relational.<sup>71</sup> The other way of meeting the extra qualia argument is to treat the phenomenal character of experience as fully relational.

### 3.6 *Common Features and Synaesthetic Disjunctions*

For the presentationist the phenomenal character of experience is provided by the phenomenal properties objects present to the percipient. Presentationism is firstly a theory of how veridical perception is constituted. According to the presentationist the phenomenal character of our perceptual experience is determined by the phenomenal properties objects have: 'the actual objects of perception, the external things such as trees, tables and rainbows, which one can perceive, and the properties which they manifest to one when perceived, partly constitute one's conscious experience, and hence determine the phenomenal character of one's experience'.<sup>72</sup> Martin goes on to point out the way this view differs from ER: 'This talk of constitution and determination should be taken literally; and a consequence of it is that one could not be having the very experience one has, were the objects perceived not to exist, or were they to lack the features they are perceived to have'. Dretske claims the opposite: two representations with the same sense could have different referents (each having different features) or no referent at all. This view does not deny that two representations with the same sense can constitute two different states, the one might be a veridical perceptual experience and the other might be a hallucination. Which state one were in would depend on the relations which the representational states had to the world. But with respect to what constitutes the phenomenal character of experience the two representations belong to the one type of representational state.<sup>73</sup> For EP 'it is of the essence of such states of mind that they are partly constituted by

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<sup>71</sup> Intentional content is not an intermediary; it explains how objects come to be objects of awareness consistent with the view that experiential states form a highest common factor between veridical and non-veridical states. See Martin forthcoming.

<sup>72</sup> Martin 1997: 83-4.

<sup>73</sup> In this respect representationism aligns with phenomenism.

such objects, and their phenomenal characters are determined by those objects and their qualities. So one could not have such a type of state of mind were one not perceiving some object and correctly perceiving it to have the features it manifests itself as having'.<sup>74</sup> With respect to what constitutes the phenomenal character of experience, according to EP, veridical experiences and non-veridical experiences do not belong to the same type of state.

ER can agree with EP about what is usually before the mind, namely the external objects of perception, but they disagree about how these external objects are before the mind. For ER external objects of perception are objects of representational states; their existence is not entailed by those intentional states. For EP if objects are the objects of a perceptual state then their existence is entailed by those perceptual states. One consequence of EP, as opposed to ER, is that the experiential state one is in is sufficient to guarantee a way the world is. Of course, one may not be aware of the state one is in, for being in a perceptual state, which is sufficient to guarantee a way the world is, does not discount one being in a non-veridical state which is indiscriminable from such a veridical state. This may be an epistemological difficulty for the presentationist, but it is not a metaphysical one. Even though there is a possible situation in which a subject is deluded and in which it may be just like it is for a subject who is presently veridically perceiving, this does not mean that one could be in the same type of state of mind in the two possible situations. In the one situation the subject is perceiving veridically and the character of perception is constituted by perceptible properties of objects; there is a state of perception. In the other situation it is as if the subject is perceiving veridically; there is a state of hallucination.

The presentationist denies that there is any type of state common to a veridical experience and non-veridical experiences indiscriminable from it. Veridical perception is not a conjunction of a type of state common to it and non-veridical experiences indiscriminable from it plus states of affairs in the world. Rather the relationship between a veridical experience and non-veridical experiences indiscriminable it is characterised by a certain reading of a disjunctive claim. McDowell has expressed

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<sup>74</sup>Martin 1997: 83-4.

this reading of the disjunctive claim in the following way: ‘an appearance that such-and-such is the case can be either a mere appearance or the fact made manifest to someone [...] the object of experience in the deceptive case is a mere appearance. But we are not to accept that in the non-deceptive cases too the object of experience is a mere appearance, and hence something that falls short of the fact itself’.<sup>75</sup> When it looks to S that there is a church bell before her either:

[P] There is a church bell before S

or

[Q] It merely looks to S that there is a church bell before her.

S is unable to tell whether [P] or [Q] is the case. According to ER the inability of S to distinguish which of the disjuncts is the case can be explained by the fact that S is in a representational state which she would be in were either [P] or [Q] the case. According to EP the only reason for putting these states of affairs together is that S is unable to distinguish them.

But as Martin has argued, the presentationist should not think of the disjunction of [P] and [Q] as involving two radically different states of affairs.<sup>76</sup> The one way one might try to distinguish the class including all instances of [Q] is by their being indiscriminable from veridical perceptions. But this clearly will not work because indiscriminability cannot be the distinguishing characteristic, ‘for veridical perceptions, are, simply in virtue of their identity, indistinguishable from veridical perceptions, so all seemings and not just mere appearances meet the indistinguishability criterion’.<sup>77</sup> One way of denying that mere appearance is a common element after all is to argue that some mental states are fundamental. Martin claims that perception cannot be factored into components (an internal factor and external factors). So he argues that veridical experience has a fundamental explanatory role. It may be that veridical and non-veridical experiences cannot be

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<sup>75</sup> McDowell: 1982: 211. See also Snowdon 1980 and Martin 1997 for defences of disjunctivism with respect to perceptual experience.

<sup>76</sup> Here Martin 1997: 87 follows Williamson 1995: 560.

<sup>77</sup> Martin 1997: 83-8.

distinguished, but this is not in virtue of a class of appearances, which should be considered to have an autonomous status within the subject's mental economy. The phenomenal characters of hallucinations, which are indistinguishable from veridical perception, are only explained by reference to the phenomenal character of veridical perception; 'one can only characterise the delusive case relationally by what it is indistinguishable from'. EP would appear to have a limited explanation of non-veridical experience. Their response is that non-veridical experiences are not only deceptive about the world but also deceptive about themselves: one should not expect any more explanation of them in virtue of their appearance.

The disjunctivist view builds on a notion of discrimination. Our perception of objects and their properties requires our ability to distinguish objects from each other. In a sense, the phenomenal character of perceptual experience is also dependent upon the ability to discriminate (although this is not to suggest that phenomenal character is wholly so dependent).<sup>78</sup> So a perceptual state is the particular result of such abilities to discriminate. Sometimes, however, a subject of perception is not able to distinguish between two objects of perception; they may be indiscriminable without being identical.<sup>79</sup> The disjunctivist argument concerns the ability, or lack thereof, then to discriminate such a perceptual state from a different state. EP applies to the discrimination of mental states the natural thought that our powers of discrimination in perception are outstripped by features of the world. So there seems reason to think that we may be unable to discriminate between mental states, which might be of very different underlying natures. Although hallucinations may be explained by reference to the same local states as are referred to in explanation of veridical perceptual states according to EP those types of local physical states realise different, but indiscriminable states. In neither case is the local physical state sufficient for a mental state. It is not sufficient to explain hallucinatory experience because that requires reference to veridical perception and veridical perception is constituted by reference to properties of objects.

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<sup>78</sup> If what has been said in the previous chapter is correct, the capacity to discriminate is actually a part of the constitution of cognitive modules.

<sup>79</sup> For a full treatment see Williamson 1990.

How does EP explain the phenomenal character of synaesthetic experience? Synaesthetic experiences are not indiscriminable from veridical experiences; there are no veridical experiences from which synaesthetic experiences are indiscriminable. Nevertheless in synaesthesia experiences are had which are in the relevant respects just like veridical experiences: there is an experience of colour in the relevant respects indiscriminable from perceptual experiences of colour.<sup>80</sup> Although the phenomenal character of synaesthetic experiences may be explained by reference to the same local states as are referred to in explanation of veridical perceptual states according to EP those types of local physical states realise different, but indiscriminable states. In neither case is the local physical state sufficient for a mental state, in particular a common representational state. The local physical state is not sufficient to explain the phenomenal character of synaesthetic experience because that requires reference to veridical perception and veridical perception is constituted by reference to properties of objects. The fact that the character of synaesthetic experience of red is indiscriminable from character of the veridical experience of red in the relevant respect is not to be explained by a representational state held in common.

Synaesthesia requires the development of aspects of both ER and EP, but it does not require a development such that one of the views stands obviously above the other.

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<sup>80</sup> The phenomenal character of experience of synaesthesia is often described as 'vivid'. This suggests that it is unlike forms of experience like imagining or recalling which can be clearly distinguished from perceptual experiences.

## Chapter 4

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# Hearing Colours and Coloured Hearing

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### 4.1 *The Individuation of Modes of Perception*

Two locutions can be found in explanation of the meaning of the term 'synaesthesia'. One locution - 'hearing colours' ('seeing sounds', 'tasting shapes' etc.) - might be derived from the testimony of some synaesthetes. It has certainly been developed by popular accounts of synaesthesia. As for the derivation, consider the different ways in which synaesthetes talk about their similar experiences: 'I am a sight/sound synesthete, most often seeing sound as colors [...] It's definitely colors, but I'm not sure that 'seeing' is the most accurate description. I am seeing, but not with my eyes, if that makes sense'.<sup>1</sup> The shapes are not distinct from hearing - they are part of what hearing is ... That's what the sound is; it couldn't possibly be anything else'.<sup>2</sup> 'I see shapes and colours in response to sounds. [...] I have trouble putting into words some of the things I experience. It is like explaining red to a blind person or Middle C to a deaf person. These connections have been with me essentially since birth and are so natural that they are hard to put down on paper'.<sup>3</sup> We might expect some difficulty in talking about something which, just because it is non-standard or is not in the public domain, is not commonly talked about. As for the development, one need only mention the title of Cytowic's popular treatment of synaesthesia, *The Man who Tasted Shapes*. But consider also what he says in his later review of synaesthesia: '[...] the word 'synesthesia', meaning 'joined sensation', [...] denotes the rare capacity to hear colors, taste shapes, or experience other equally startling sensory blendings whose quality seems difficult for most of us to imagine'.<sup>4</sup> The other locution - 'coloured hearing' - derives from psychologists. In explaining synaesthesia Baron-

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<sup>1</sup> Cytowic 1989: 27, subject RP.

<sup>2</sup> Cytowic 1989: 65, subject DS

<sup>3</sup> Cytowic 1989: 32, subject MM.

<sup>4</sup> Cytowic 1996.

Cohen and Harrison write: '[...] he may well have experienced coloured-hearing synaesthesia, a condition in which a sensation in one modality gives rise to sensations in another'.<sup>5</sup> In the previous chapters the second locution, that of coloured hearing, has been adopted. It is a technical term. But it might be neither an obvious nor a natural way of talking of synaesthesia, as the synaesthetes themselves suggest.<sup>6</sup>

We are clearly able to use terms to represent modes of perception, that is to say, we have a command of concepts of modes of perception. We are generally able to accept certain states as states of seeing and other states as states of hearing. But it is one thing to possess a concept of a mode of perception and it is another thing to have an explicit understanding of what is involved in that conceptualisation. It may be that some people possess the concept of a mode of perception without thinking about the grounds they have for using that concept; that is one way in which someone might not have an explicit understanding of the concept of a mode of perception. Perhaps that is why some people refer to the relevant type of synaesthesia as 'hearing colours'. It might be that other people, such as philosophers, consider the grounds they have for using the concept of a mode of perception but they disagree about what grounds constitute such a concept. It might be for this reason that the locution of 'hearing colours' is rejected for different reasons.

Suppose words express the concepts we use to represent the world. Let us further suppose that concepts stand to properties in the way that modes of presentation stand to objects. The locutions 'hearing colours' and 'coloured hearing' might express two different ways of thinking about the one property of undergoing synaesthetic experiences; both ways of speaking would relate existing concepts of ours in different ways in order to represent the same property. However we would have to reject one way of speaking in favour of the other if it could be shown that one of the two locutions made no sense, or if it could be shown that the two locutions had different references and that we were actually talking about one of those possible

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<sup>5</sup> Baron-Cohen & Harrison 1995. As outlined in chapter one, this is in keeping with a tradition dating from the late nineteenth century.

<sup>6</sup> It might be argued by synaesthetes themselves that they do not seem to be undergoing coloured hearing. But then how would synaesthetes know what it was like to undergo coloured-hearing? It might be just how it is to undergo synaesthesia.

referents rather than the other. Deciding between the two locutions requires deeper consideration of the semantics of perception terms.

This chapter examines how and why we might think (and talk) about synaesthesia given the context of other standard perceptual processes. In so doing it focuses the attention on how and why we think (and talk) about modes of perception. It is uncontroversial that sensory modalities are individuated by a combination of criteria: the diverse objects of perception, the distinct characters of perceptual experience, the diverse media of perception and different types of perceptual organ (and perhaps neural processing). It is a plausible suggestion that we can distinguish a sensory modality *qua* sensory modality only if we can distinguish it from other sensory modalities. It is not clear that perceptual modalities can be distinguished if one were only acquainted with the distinct characters of a particular perceptual modality for reasons given in section 4.2. For reasons given in section 4.3 there are difficulties with the view that a perceptual modality could be distinguished if we were only to be acquainted with the objects of that perceptual modality. It seems implausible that perceptual modalities can be individuated by reference only to perceptual organs, independently of how they function. Would we be able to tell that an object we had never seen before were a new kind of sensory organ unless we also knew what it was causally related to? Perceptual modalities are individuated, and known to be so individuated, by reference to a number of criteria. If none of these criteria are sufficient are they all necessary? And how are these criteria related to each other? Are some criteria more basic than others in the individuation of perceptual modalities? On what evidence do we distinguish one perceptual modality from another one? The considerations of this chapter, which arise from an analysis of synaesthesia, are intended to shed some light on these issues.

The first question to ask is: how should we represent synaesthesia given the concepts of modes of perception we have and thus how should we express this representation in language? Such would lead to a response to the problem posed by the presence of the two different locutions described in the first paragraph of this chapter. It would at the same time lead to a clearer understanding of what is involved in our conceptualisation of modes of perception. Concepts are one way of

representing the world. According to some of the theories of perceptual experience discussed in the previous chapter some properties objects possess are also represented by us nonconceptually; this is supposed to contribute to an explanation of the phenomenal character of perceptual experience. Some properties of objects are represented via specific sensory modalities: the colours objects have are represented via seeing, the sounds objects make are represented via hearing, the smells objects have are represented via smell and the taste objects have are represented via taste. We clearly have concepts of modes of perception. But are modes of perception represented non-conceptually? This issue relates to the issue of how we represent modes of perception conceptually: in so far as we represent nonconceptually properties as being of a particular modality, we might be constrained in the conceptualisations could make (and thus the locutions we could employ).

The following discussion of the way we represent modes of perception is arranged as follows. The rejection of the first way of thinking (that synaesthetes hear colours, see sounds, taste shapes) and thus the form of locution ('hearing colours' ('seeing sounds', 'tasting shapes' etc.) occupies section 4.2. The section includes a discussion of an example and a line of argument concerning our concepts of modes of perception (and *perceptibilia*) proposed by Johnston. Although Johnston rejects the first way of talking about synaesthesia on the grounds that it is meaningless, the interpretation he gives of a case of synaesthesia, and of why this does not support the first locution, is open to certain objections. Consequently a different route to the rejection of the notion of hearing colours is required. This route suggests a priority of some individuating conditions for modes of perception over others, specifically the presupposition of the relation between determinate kinds of perceptual organs and the diverse objects of perception above determinate kinds of characters of experience. If we do think of modes of perception in this way it might be that the notion of 'hearing colours' is not meaningless but false.

In section 4.3 a related issue is considered: whether it is even metaphysically possible to hear colours. It may be that it is not possible to hear colours in the actual world given our concepts of modes of perception and *perceptibilia* and the way the

actual world is constituted; it is a further question whether it is metaphysically impossible to hear colours, given our concepts of modes of perception and perceptibilia and the way the world could be constituted. A possible world is discussed in which our experience was qualitatively similar to how it actually is and yet we were perceiving via a different perceptual modality. Of such a world it would make sense to talk of 'hearing colours' if it were stipulated that a perceptual modality is primarily individuated by a perceptual organ and it were also held that colours supervened on properties that sensory organ was related to. Of course the supervenience claim may not be attractive, that is not the point, if it were rejected it would have to be rejected on grounds other than conceptual grounds or grounds of acquaintance, the usual grounds for rejecting the notion of hearing colours.

In section 4.4 the adoption of the second form of locution is considered. This involves an examination and extension of the adverbial approach to perception. The adverbial approach is used to show that our talk of phenomenal objects can be rejected in favour of adverbial modifications. In the present case the adverbialism can be further rendered by the term 'coloured', now however having an extended sense. There is no reason for employing an adverbial analysis to justify the usage of the locution 'coloured hearing' unless one can explicate the content of the underlying concept expressed by the extended sense of the term 'coloured'. The extended sense of the term 'coloured' introduced through an adverbial analysis is compatible with a version of nonconceptual representational content. In section 4.5 I elaborate on the relative importance of the different criteria of distinctive sensory modalities.

#### *4.2 Revelation and Explanation: A Case Study*

Some people claim it to be an empirical fact, perhaps even an important empirical fact, that colours can be heard and sounds can be seen: 'Are there really people who can hear colors, taste shapes, see pain, and have their various senses filled with color? After collecting cases over a number of years, I conclude that the answer is unequivocally yes'.<sup>7</sup> Reconsider what Merleau-Ponty said about synaesthesia: 'For

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<sup>7</sup> Cytowic 1989: 1-2. Cytowic gives as a reason for synaesthesia being a perceptual process the fact

the subject does not say only that he has the sensation both of a sound and a colour: it is the sound itself that he sees where colours are formed'.<sup>8</sup> Synaesthesia, no doubt, provides psychologists with a further set of data, which calls for explanation. The suggestion, in some quarters, seems to be that this set of data shows us, perhaps for the first time, that what is usually sensed via one modality can also be sensed via another modality: colours are usually seen, but synaesthesia shows us that they can actually be heard too; sounds are usually heard, but synaesthesia shows us that they can actually be seen too. On this view, the locutions 'hearing colours' and 'seeing sounds' and so on not only make sense, they turn out to have items, or states of affairs, to which they apply.

Some people, probably most people, would reject this view. It might be observed that, although the data cannot plausibly be denied, they have still to be related to an existing conceptual framework. What makes language meaningful depends both on the world and on us. Claiming synaesthesia as proof that colours can be heard neglects this latter element. On this second view, to describe a case of synaesthesia as a process either of hearing colours or of seeing sounds is just to misdescribe it; it is to misapply our concepts.<sup>9</sup> But it may not be immediately clear why concepts have been misapplied. Or objections might be found in different places. Is it because those who misapply their concepts in this way use the terms 'hearing' and 'seeing' when they should not? Or because they use the terms 'colour' and 'sound' when they should not? Or because they use combinations of the terms, as in 'hearing colours' or 'seeing sounds', when they should not? The view to be endorsed here is that to talk of the processes underlying synaesthesia as, for instance, ones of 'hearing colours' or 'seeing sounds', is indeed to misdescribe them. Exactly how this is so will become clearer by comparison with another argument, due to Johnston, which endorses a similar conclusion by different means.<sup>10</sup>

Johnston suggests that: 'the philosophy of color is one of those genial areas of

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that it is a product of the brain rather than the mind. This is an invalid inference; hallucinations are brain processes, but we do not think of them as perceptual processes.

<sup>8</sup> Merleau-Ponty 1962: 229.

<sup>9</sup> The use of scare quotes - 'hearing' colours and 'seeing' sounds - is meant to endorse this view.

<sup>10</sup> Johnston 1992, republished 1997, references will be made to the latter.

inquiry in which the main competing positions are each in their own way perfectly true. For example, as between those who say that the external world is colored and those who say that the external world is not colored, the judicious choice is to agree with both'.<sup>11</sup> This suggestion derives from a view about the beliefs we have about colour from our experience of colour. Of the beliefs about colour to which we are susceptible given our visual experience and the way we take that experience, some are 'core' and some are 'peripheral'. Beliefs are 'core' in the sense that if they turned out to be untrue 'we would have trouble saying what they were false of'; in the process we would have been deprived of a subject matter. They are 'peripheral' in the sense that we can reject them without changing a stable subject matter. The former might involve what would be called analytic or conceptual truths (truths in virtue of the content of the concepts involved); the latter might involve what would be called synthetic truths (truths in virtue of both the content of the concepts involved and the world). According to Johnston the lack of any sharp analytic/synthetic distinction allows one to draw the boundary between the core and periphery beliefs at different points. One can agree with the view that the world is coloured and with the view that the world is not coloured by drawing the boundary between the core and peripheral beliefs at different places.

But what makes us draw the boundary at a specific point? Johnston claims that one can agree with the view that the world is not coloured in that one draws the boundary in one place: one agrees with the view that 'ever so inclusively speaking the external world is not colored'. To speak 'ever so inclusively' of colour is to employ a conception of colour which 'underwrites' every belief included in the core; if we include all such beliefs we will have to agree with the view that the world is not coloured. But Johnston also claims that such a conception of colour is 'internally inconsistent'. This being so however we should not consider revision of our talk of colour but consider 'how inclusively we have to speak'. Johnston's view is that we should not revise our core beliefs but employ a conception of colour which underwrites most but not all of those core beliefs. One agrees with the view that the world is coloured if one draws the boundary in another place: one agrees with the

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<sup>11</sup> Johnston 1997: 137.

view that 'more or less inclusively speaking the external world is colored'.<sup>12</sup>

Johnston develops this view by reference to five beliefs about colour, which he claims can be regarded as core beliefs. Consider canary yellow as a typical colour the five core beliefs concern: paradigms (some paradigm examples of canary yellow things (e.g. some canaries) are canary yellow); explanation (something being canary yellow sometimes explains our experience of canary yellow things); unity (colours like canary yellow have their own place in the network of similarity, difference and exclusion relations of the whole family of shades); availability (justified beliefs about the canary yellowness of things are available simply on the basis of visual experience); and revelation (the intrinsic nature of canary yellow is 'fully revealed by a standard visual experience as of a canary yellow thing'). These five beliefs, are at times in tension with each other. For instance, revelation and explanation seem in tension; a visual experience is supposed to fully reveal the intrinsic nature of colour, yet it does not reveal the underlying properties of colour, which sometimes explain the experience of colour. According to Johnston, to include all the beliefs in the core we would have to assume that the external world is not coloured. Johnston believes that we should not consider elimination or revision of talk but should consider compromise, of speaking of colour less inclusively, that is to say, having a conception of colour which includes as many of the beliefs as possible. That turns out to be a secondary quality view.

This seems a puzzling premise for an argument. Surely if explanation and revelation conflict in the way Johnston says they do in order to motivate his view that ever so inclusively speaking the world is not coloured then there is in fact no ever so inclusively way of speaking of colour. Then the question arises as to why we should relegate our belief about explanation rather than revelation? He favours the view that ordinarily we are inclined towards the pull of revelation (hence it is a core belief) but in so doing we are making a cognitive error. The present discussion can also be seen as raising further questions about the notion of revelation, specifically whether we are indeed inclined towards its pull (and therefore whether it is core belief). And therefore

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<sup>12</sup> Johnston 1997: 137.

indirectly it questions the view that the best tactic to take towards our talk of colour is to accommodate the notion of revelation and thus the claim that a secondary quality view should be adopted. But the following discussion will focus on perceptual modalities.

Matters will be made easier by taking a concrete example. Johnston considers the case of the composer Alexander Scriabin (1872-1915) of whom it has been suggested, probably wrongly, that he was synaesthetic.<sup>13</sup> Johnston says that although what it was like to be Scriabin is an interesting question whatever it was it would not have made him think he was seeing sounds. Even if 'the visual experiences Scriabin had when he heard B-flat presented themselves as revelations of the nature of B-flat [...] it is hard not to imagine Scriabin then going on to think of B-flat as a sensible complex with two sides to its nature, the one which all people with perfect pitch knew, and the other reserved for him and a few other select souls'.<sup>14</sup> What he could not have 'coherently thought' according to Johnston was that B-flat was a 'simple quality whose nature was as much revealed by vision as by hearing'. In opposition to those who might say that synaesthesia is the rare capacity to see sounds, Johnston claims that cases of synaesthesia, like the one exemplified by Scriabin, are cases in which it simply makes no sense to say that synaesthetes 'saw the sound B-flat'. What might presumably be said is that Scriabin heard B-flat along with everyone else and in some other way knew the other side of the sensible complex B-flat. Most importantly the locution 'seeing sounds' here makes no sense, it expresses an 'absurd thought', for the reason that it is 'ruled out by our intuitive condition on *visibilia*'.

The intuitive condition on *visibilia* Johnston is referring to here is explicated in a preceding passage with respect to the faculty of vision:

The faculty of vision either represents itself as (or is spontaneously taken by its possessors as) a mode of revelation of the natures of certain properties of visible things, viz. their colours and Euclidean shapes. A particular counts as visible only if it has visible properties and it has visible properties only if it has properties with whose nature

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<sup>13</sup> See Myers 1915. It is questionable whether Scriabin was truly synaesthetic. Myers records a conversation with Scriabin in which the latter admitted that when listening to music he just had a feeling of colour, only when the feeling was very intense did it pass over into an image of colour. But the question of the genuineness or otherwise of Scriabin's synaesthesia is not important for present purposes.

<sup>14</sup> Johnston 1997: 164.

vision acquaints us.<sup>15</sup>

This intuitive condition on visibilia, as things which have properties ‘with whose nature vision acquaints us’ allows Johnston to rule out Scriabin’s experience as one of ‘seeing sounds’ or, in other words, to endorse the use of scare quotes in the locution ‘“seeing sounds”’. One might think of the necessary and sufficient conditions of a property being visible. Although ‘it is a necessary condition of a property F being visible that something’s having F at some time explains a visual experience, this is not sufficient’; a sound property may explain a visual experience without being a ‘visible property’ because ‘vision does not acquaint us with the nature of [this property] but only with [its] effects’.<sup>16</sup>

As Johnston reiterates with respect to the thought that the ‘physical properties associated with sound could also have been the dominant cause of our visual experiences, ‘this would not have been a case in which we would have ‘seen sound in the relevant sense’. His conclusion is that: ‘the trouble with the idea that we could have seen the sound properties is that vision could tell us nothing about the natures of such properties, it could not acquaint us with the way these properties intrinsically are, it could only acquaint us with their effects’.<sup>17</sup> Even in the bizarre possible world in which ‘similar physical processes are causally responsible for both the appearance of canary yellow and the sound of B-flat (Johnston presumably means soundwaves) it would be wrong to say that we see B-flat as we see canary yellow’. What goes for the possible world goes for the actual world: ‘It would have been equally wrong to say this if the actual world had turned out to be bizarre in just this way’. The reason for this is that we would not then have perceived the intrinsic properties of sound by means of vision. Presumably as hard as we look in the direction from which a sound is coming from we would not see its intrinsic properties.’<sup>18</sup>

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<sup>15</sup> Johnston 1997: 164.

<sup>16</sup> Johnston 1997: 164.

<sup>17</sup> Johnston 1997: 164.

<sup>18</sup> For reasons to be explained in the next section I take it that in a possible world in which the physical processes responsible for the appearance of canary yellow might be those that are responsible for the appearance of B-flat in the actual world (soundwaves). In such a case it might make sense to say that colours were heard (rather than that sounds were seen).

Johnston's line of reasoning can also be directed against the view that some people hear colours. We can repeat his definition, *mutatis mutandis*, for hearing:

The faculty of hearing either represents itself as (or is spontaneously taken by its possessors as) a mode of revelation of the natures of certain properties of audible things (or events), viz. their sounds. A particular counts as audible only if it has audible properties and it has audible properties only if it has properties with whose nature hearing acquaints us.

One might think of the necessary and sufficient conditions of a property being audible. Although it is a necessary condition of a property F being audible that something's having F at some time explains an auditory experience, this is not sufficient; a colour property may explain an auditory experience without being an audible property because hearing does not acquaint us with the nature of this property but only with its effects.

The locution of 'hearing colours' would make no sense for reasons parallel to those employed to show the senselessness of 'seeing sounds'. Consider the reverse form of synaesthesia. Suppose that every time a bright red light was turned on a synaesthete (of the relevant variety) in the vicinity experienced a tone of a certain frequency. Johnston, according to his definition, would have to say that this would not be a case of hearing colours because hearing does not reveal the intrinsic nature of the bright red light, only its effects. Even in the bizarre possible world in which similar physical processes (i.e. lightwaves) are causally responsible for both the appearance of B-flat and the appearance of canary yellow it would be wrong to say that we hear canary yellow as we hear B-flat. The reason for this is that we would not in such a world have perceived the intrinsic properties of colour by means of hearing. Presumably as hard as we listen in the direction of a coloured object we do not hear its intrinsic visible properties.<sup>19</sup>

The proposal is thus that there is some sort of essential relation, revealed to us in perception, which holds between vision and colour and Euclidean shape (namely, visibilia) and between hearing and sounds. So to think or talk of a case of

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<sup>19</sup> And equivalently in a possible world in which the physical processes responsible for the appearance of B-flat might be those that are responsible for the appearance of canary yellow in the actual world (lightwaves). In such a case it might make sense to say that sounds were seen (rather than colours were heard).

synaesthesia as a case of seeing sounds would be to ignore the essential relation between vision and visibilia. And to think or talk of a case of synaesthesia as a case of hearing colours would be to ignore the essential relation between audition and *audibilia*. It is perhaps curious that one of our core beliefs should not be immediately acknowledged by everyone. Merleau-Ponty for one did not think it was obvious: 'For the subject does not say only that he has the sensation both of a sound and a colour: it is the sound itself that he sees where colours are formed'.<sup>20</sup> Neither do synaesthetes seem to think that it is obvious. More than a little thought is required either to reveal to us any essential relation between vision and visibilia or to exclude synaesthetic experiences from counting as instances of seeing sounds; it is not immediately 'revealed' in vision and in hearing.

According to Johnston's view we are forced to reject the claim that synaesthesia shows it to be an empirical fact that some people see sounds and hear colours as incoherent. It is a necessary falsehood. But why should we believe this necessary falsehood on the basis of revelation? Although Johnston's thesis seems to be a conceptual or analytic thesis ('seeing sounds' expresses an 'absurd thought'), it seems also to be based on the evidence of the senses. Colours are revealed in vision as visible properties and sounds are revealed in audition as audible properties. But this is surely *a posteriori* evidence. It might of course be an *a posteriori* necessity that we can neither see sounds nor hear colours. But it is not clear that revelation can deliver this truth. For one thing it seems to be derived from the belief of normal perceivers that as hard as they look they cannot perceive the intrinsic properties of sounds, and therefore sounds cannot be seen, and as hard as they listen they cannot perceive the intrinsic properties of colours, and therefore colours cannot be heard. But this does not tell us about what other perceivers can possibly perceive. So the notion of revelation has a considerable load to bear in the argument. And since this is based on the notion that the 'faculty of vision either represents itself as (or is spontaneously taken by its possessors as) a mode of revelation of the natures of certain properties of

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<sup>20</sup> Merleau-Ponty 1962: 228. Psychologists would probably dispute Merleau-Ponty's description of what synaesthetes' experience, in particular the replacement of one phenomenal character by another. The point is that Merleau-Ponty thought that it is possible to see sounds.

visible things, viz. their colours and Euclidean shapes' this notion has just as much a load to bear.

The notion that the faculty of vision represents itself as a mode of revelation of the natures of certain properties of visible things thus involves a circularity: vision is that which reveals visible properties and visible properties are what are revealed by vision. It is informative in so far as vision reveals the intrinsic properties of visibilia. It does not represent itself as (and presumably therefore it represents itself as not) revealing the intrinsic properties of sounds and other non-visible perceptible properties, only, in the case of synaesthetes, their non-intrinsic properties. But why are we to believe this? Why are we to believe that modes of perception reveal different intrinsic properties of objects and, in the case of synaesthetes, only reveal non-intrinsic properties, on the basis of revelation alone? To differentiate between intrinsic and non-intrinsic properties in this way might we not think it obvious to look for a different kind of evidence? Rather than rely on revelation might we not try to find out whether there were any causal features common to the synaesthetic experiences of colour and veridical experiences of colour and sound? This thought becomes more pressing if Johnston got things the wrong way round: it was not that Scriabin might have been seeing sounds, it was that he might have been hearing colours. The sound B-flat might have colour properties that only synaesthetes can be acquainted with and they are acquainted with them via hearing. The only way we can tell this is via evidence other than that which is revealed in perceptual acquaintance. We should rely on more than the deliverances of revelation. This does not automatically show that we might nevertheless normally be subject to the 'pull of revelation'. How might this be?

The claim of revelation might be understood in another way: the nature of vision, as a mode of revelation, is revealed by the fact that certain properties of the external world, such as colours and Euclidean shapes, are represented to us as being perceived visually; whether something is visible is given in the content of experience. Similarly the nature of audition, as a mode of revelation, is revealed by the fact that certain properties of the external world, properties of sound, are represented to us as being perceived auditorily; whether something is audible is given in the content of

experience. The character of an experience of colour is given as a visual experience and the character of an experience of sound is given as an auditory experience; these would be intrinsic properties of the respective experiences. Some support for this reading comes from Johnston's usage of the terminology 'visual experience' to describe the anomalous features of Scriabin's synaesthetic experience. The best reason for considering these to be visual experiences might be that whether an experience is a visual experience or not is given in the character of the experience. If this is so then it makes no sense to say that sounds can be seen, nor that colours can be heard. Colours and Euclidean shapes are perceived as visible properties and properties of sounds are perceived as audible properties. Visible properties cannot be perceived as visible properties unless they are perceived by vision, and audible properties cannot be perceived as audible properties unless they are perceived by hearing.<sup>21</sup>

The trouble is that this begs the question in a similar way to the first characterisation of revelation. What reason have we to think that Scriabin's synaesthetic experiences were visual experiences? And what reason have we for thinking that the characters of experience distinctive of other sensory modalities are represented by their subjects as being of a specific modality? Presumably only the deliverances of revelation. Ryle warns of the difficulty here:

What then of the other, sophisticated sense of 'sensation', the sense in which it is said that seeing involves having visual sensations or impressions? Sensations or impressions in this sense are not things that people mention, until they have at least a hearsay knowledge of physiological, psychological or epistemological theories. Yet long before they reach this level of edification, they know how to use verbs of perception, like 'see', 'hear', 'taste', 'smell', and 'feel', and they use them then just as they continue to use them after edification. So the sophisticated concept of sensations or impressions is not a component of their concepts of perception.<sup>22</sup>

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<sup>21</sup> In the context of the current discussion consider also a related remark by Peacocke (1984: 371) about why his theory of vision does not make it: 'a mysterious inexplicable necessary truth that one cannot experience objects as red in modalities other than the visual: the impossibility is rather a simple consequence of an account of what it is for an object to be red which mentions specifically a feature special to visual appearance (viz. a red quale)'. Searle (1983: 48) also argues that contents visually entertained are contents which essentially involve the concept of vision. They are complex self-referential contents; being visually aware of something is a way of being aware of oneself in a certain way.

<sup>22</sup> Ryle 1949: 229.

Perhaps it would be better to remain neutral about whether the anomalous features of the synaesthetic experience should be characterised as 'visual experiences'. Or we might think of anomalous features of the synaesthetic experience as 'visual experiences' for another quite different reason. Namely, that they are experiences as of colour and shape and experiences of colour and shape do partly constitute visual experiences. But normal experiences of colour and Euclidean shape need not be visual experiences because they are revealed to us as such, but because they involve the mediation of specific external stimuli by our visual organs. So it may be better if we do not consider the type of synaesthetic experiences supposedly undergone by Scriabin as visual experiences just because they are revealed as such but because they are as of colour and Euclidean shape.

There is another way of thinking of this reading of Johnston's thesis: by way of relating the character of experience to the notion of acquaintance (recall that the metaphysical issue of the individuation of perceptual modalities is closely related to the epistemic issue of how we know perceptual modalities to be distinct). We would know that we were perceiving via a particular sensory modality through the character of the experience if the character of experience were self-intimating in some way. According to Johnston, a mode of perception reveals certain properties. But the mode of perception is not to be distinguished by those properties, for the properties are distinctive only because revealed by a sort of acquaintance and acquaintance (a certain kind of knowledge) is determined by the kind of experience we have. In the case of vision, that we are visually acquainted with features would be indicated by having a certain sort of experience which reveals the nature of visible properties.

The problem with this way of thinking is that Johnston then states that synaesthetes do not see sounds because the (visual) experiences (which would seem to indicate visual acquaintance) do not actually acquaint synaesthetes with the nature of sounds. Rejection of the possibility that Scriabin sees sounds however will only work if the sensory modality is actually being distinguished by the nature of the intrinsic properties of what is perceived, rather than by the nature of the experience, which is supposed to reveal those properties.

There are other difficulties for this view. If acquaintance were self-intimating in this way, synaesthetes would naturally be deceived, they would take themselves to have had a visual experience. But it seems that it is not clearly the case for synaesthetes; they are not obviously deceived. As the quotations of the opening section show, some may say they are having a visual experience and seeing sounds, others may think they are hearing. The question of appearance is often subordinated to other criteria. Synaesthetes may even revise their view that they see sound or hear colours.

The suggestion that we could always individuate seeing and hearing solely by acquaintance with the colours and the sounds might be flawed in another way. Underlying the suggestion is the view that the sensory modalities could be individuated by the distinctive phenomenal characters of the experiences of colours and sounds alone. As things stand, we are indeed able to discriminate colours from each other in seeing things, discriminate sounds from each other in hearing things, and discriminate colours and sounds from each other in seeing and hearing things. In line with one way of understanding the phenomenal character of perceptual experiences of particular perceptual modalities such characters would belong to distinct classes because they belong to distinct quality spaces. A creature, which can see, possesses a visual quality space. A creature, which can hear, possesses an auditory quality space. Although these quality spaces are actualised by external stimuli, the possession of a quality space involves the possession of discriminatory abilities.

Whereas the visual quality space and the auditory quality spaces are each constituted by processes of discrimination and the presence of indiscriminability (see section 1.4), the two quality spaces can be individuated because we can always discriminate between a colour character and a sound character. There is no indiscriminability present here. It would be for this reason that we have two quality spaces and thus that we have two distinct sensory modalities. But can we assume, just because we do discriminate between tokens of the two types of character, that this is necessarily so? Perhaps a creature could be so constituted as to fail to discriminate between the two types of character of experience. Suppose it was not

designed to discriminate between them. In this case both quality spaces would turn out to be subspaces of the same quality space. In other words we have no reason for thinking that visual quality space and auditory quality space are distinct quality spaces in virtue of anything intrinsic to particular experiences. The way those experiences are had has to be adverted to in order to distinguish a sensory modality.

There is another comment of Johnston's, which supports the present reading. Johnston claims that vision could acquaint us with the effects of audible properties. Presumably the thought is that these effects of sounds are experiences of colour and shape which vision reveals to us. But it might, at this point, be wondered whether it makes sense to say that vision could acquaint us with the effects of audible properties. It might be true that vision acquaints us with visible properties. It might be true that vision acquaints us with the effects of audible properties, as when audible properties also affect visible properties; such as when sounds of sufficient energy affect physical objects visibly. In the case of synaesthesia though, if one said anything, one would surely say that part of their visual system acquaints a synaesthete with the effects of audible properties. But the functioning of part of the visual system is not the same as vision. To see this one only needs to consider the following kind of example. A blind person, if they were synaesthetic, might still be acquainted with the effects of audible properties. Yet it would not be by means of vision for by hypothesis they would be blind; they only have part of their visual system functioning properly.

It might even be argued that in this case the intrinsic properties of colours could be revealed by hearing in some sense of the notion of revelation intended by Johnston. If a synaesthete were blind they might still have experiences of colour enabled by sounds. According to revelation the intrinsic nature of e.g. canary yellow is fully revealed by a standard visual experience as of a canary yellow thing. Surely what is important is that what it is like to be a particular colour (e.g. canary yellow) is fully revealed in such an experience. But this central feature, what it is like to be the colour canary yellow, might be fulfilled by a synaesthetic experience of canary yellow enabled by B-flat. So it would not even be that colours could only be revealed by vision. Yet another reason to be wary of the notion of revelation.

There is a final point. Johnston asks whether the visual experiences Scriabin

had when he heard B-flat presented themselves as revelations of the nature of B-flat. If they did does this not also cast doubt on the deliverances of revelation? The only way we can confirm the nature of B-flat is if we have other ways of showing that the synaesthetic revelations should not be considered a property of the sound but of something going on in Scriabin. And we do have independent grounds for thinking that what is going on is not that B-flat is a sensible complex with two sides to its nature, the one which all people with perfect pitch know, and the other reserved for him and a 'few other select souls'. Although some indication that synaesthesia is not a process of revealing the intrinsic nature of perceptible properties comes from the fact that different synaesthetes experience different colours in response to the same sounds, the best evidence comes from fact that there is no suggestion that soundwaves are complex in the relevant way. Science has shown us that synaesthesia was not actually a process of perceiving a sensible complex. If there could be something qualitatively the same as revelation in this case, why not in the case of normal perceptual processes? But by now I hope that enough problems have been raised with the notion of revelation to challenge the idea that we do even feel its pull.

In the next section I shall question whether it makes sense to think that sounds could be seen and colours could be heard (i.e. whether there is a possible world in which creatures relevantly like us could see sounds and hear colours). But before this, it still has to be argued that it is not true that synaesthetes see sounds. There is another way to motivate the view that this case of synaesthesia should not be considered a case of seeing sounds. A necessary condition of what we take to be cases of seeing (and therefore constitutive of our concept of vision) is the mediation of a specific type of stimuli external to our bodies by our visual organs, namely our eyes. Consider how we typically teach the use of the term 'seeing' by reference to visual organs. Of course, one has to understand the notion of vision in such a way as not to rely upon a prior notion derived from our introspection upon vision. The way we grasp the concept of vision by reference to paradigm visual organs and their functions (although we may not put it quite like that if we are teaching someone the concept of vision) arguably does not rely upon a prior notion derived from our

introspection upon vision. There is reason to think that the blind have such a grasp of the concept of vision without having the resources of introspection the sighted have at their disposal.

In Scriabin's case of synaesthesia there is no such mediation by a visual organ; it is just false to say that this is a case of seeing, therefore *a fortiori* it could not be a case of seeing sounds. A little further reflection should quickly confirm that Scriabin's case should not be considered a case of seeing sounds. He would not see better by looking closer at the sound and he would perceive the sound in just the same way if he were to close his eyes. An analogous account can be given for hearing, which can be used to respond to the reverse example. It should not be thought of as a case of hearing colours because our subject was not undergoing an auditory process at all when stimulated by the bright red light; this requires the mediation of external stimuli by auditory organs.

If anything the mode of perception involved in the Scriabin example is that of hearing. It might be the case that the colours were clearer if Scriabin listened more carefully and he might fail to experience the colours if he stopped his ears. Perhaps it is a case of hearing colours after all? We need not admit that these are cases of hearing colours, but for different reasons. For there is another necessary condition for what we take to be cases of perceiving generally. It is a necessary condition of perception having occurred that the objects and properties of the world, which are perceived, exist independently of the perceptual processes involved. That is to say, it is a core belief about hearing that it is existence-entailing of objects or properties or events independent of the process of hearing and, similarly, it is a core belief about vision that it is existence-entailing of objects or properties or events independent of the visual process. Once we realise the preceding condition on the individuation of sensory modalities, all we need to accept is that in the examples the 'colour' in the experience as of colour produced in the first case and the 'sound' in the experience as of sound produced in the second case do not exist independently of the respective acts of perception. The reason we believe this, as already noted, is that we have good scientific reason to believe our distinctive sensory organs each only mediate characteristic types of physical stimuli.

The upshot of the present discussion of synaesthesia is that there is a less controversial way of explaining away the claim that Scriabin saw sounds or heard colours. This way suggests that some features are logically prior to the determination of (and speaking of) our perceptual modalities and even to the determination of anomalous perceptual processes. Nevertheless, one point should be made about the significance of character. The character of experience is special in the sense that if it is not sufficient to individuate a sensory modality in the first place, it is normally (but not always) what we use to individuate a sensory experience once we know that modes of perception are normally distinguished by a particular character. After all, is not the phenomenology of perception stressed as the means of access we have (and sometimes the means of denying access) to the things themselves?<sup>23</sup>

### 4.3 *Perceiving and Possibility*

To say that one sees with one's eyes is, according to at least one reliable source, to present a pleonasm. According to a recent edition of *The Oxford English Dictionary*, to say that one 'sees with one's eyes' requires 'the use of more words than are needed to give the sense' of a thought. Earlier editions of *The OED* give as an example of a pleonasm 'to hear with one's own ears'. Presumably the thought is not only that one can perceive only by using one's own perceptual apparatus, but also that one can only perceive via a particular perceptual modality by using a distinctive type of perceptual apparatus of one's own. Perceptual modalities are at least partially individuated in virtue of distinctive perceptual organs.

To doubt whether seeing with one's eyes or hearing with one's ears is an example of a pleonasm would be to suggest that it is informative to say that one sees with one's eyes or one hears with one's ears. Perhaps it could have been the case that a creature saw with a different part of its body or a creature heard with a different part of its body?

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<sup>23</sup> It might be thought that in acts of the imagination we can distinguish between imagined seeing and imagined hearing solely on phenomenological grounds. That is as it may seem. But that does not mean that the distinction does not itself presuppose real cases of seeing and hearing which do require reference to distinctive perceptual organs to be distinguished.

Many creatures detect their prey by detecting infrared radiation emitted by their prey. Perhaps this is a case of seeing even though such creatures are not using their eyes. There is after all a continuity between the stimuli which are sensed in this way and those which are sensed visually. But it seems more plausible to think that since such creatures employ different sensory organs, heat sensitive sensory organs, they are not perceiving visually. The distinction between seeing and some other kind of sensory modality arises despite a continuity between stimuli in virtue of a distinct manner in which the stimuli are sensed.

Might one think hearing were taking place if features of the world, which were usually perceived by the ear, were perceived by means of a different sensory organ? The argument then has to be made that such a perceptual organ could fulfil the function of the ear without being sufficiently like an ear to be classified as an ear. It is hardly obvious that this argument could be made. Some insects detect complex vibrations generated by other insects and transmitted through plants via their legs. It has been said that such insects hear sounds through their legs. According to the present considerations, unless parts of their legs were sufficiently like ears, it would be better to say that such insects feel sounds (and it might better to say that they feel vibrations). Certainly there is a continuity between the stimuli that can be felt and the stimuli that can be heard, but we distinguish between the senses of touch and hearing in virtue of a distinction between sensory organs.

A general characterisation of the difference between sensory organs and therefore sensory modalities e.g. between auditory and tactile organs and therefore between hearing and touch, may not be easy, but in practise it is usually possible. It is easiest to draw a distinction between sensory modalities where a creature possesses distinct sensory organs. But even where a creature does not seem to possess a number of distinct sensory organs we can usually characterise the sensory modalities they possess by reference to creatures, which are more easily characterised as possessing different sensory modalities.

But in distinguishing different sensory organs we also need to recognise the proper function of a sensory organ. One recognises the proper function of a sensory organ with respect to the features of the world a perceptual organ is related to and

how it is related to those features. The view ultimately endorsed in the previous section expanded on the two pleonasms above: hearing presupposes the proper functioning of the ear and seeing presupposes the proper functioning of the eye. Scriabin was not using his eyes in the relevant respect so could not have been seeing, let alone seeing sounds. And he did not hear colours because it is the proper function of the auditory system to perceive sounds. In the other imaginary case the ears were not being employed in the relevant respect so the imagined synaesthete could not have been hearing, let alone hearing colours. And she did not see sounds because it is the proper function of the visual system to perceive colours.

If modes of perception are to be distinguished by reference to the proper functioning of sensory organs, then it is plausible to think that they can also be distinguished by reference to the type of properties of objects perceived by the relevant sensory organs when they are thus functioning. If modes of perception can also be distinguished by reference to the appropriate properties of objects perceived, then it seems plausible to think that modes of perception can also be individuated by the particular characters of experience enabled by those properties of objects. Seeing visible properties of objects enables experiences of colour, so seeing can be individuated with respect to colours. Hearing audible properties enables experiences of sounds, so hearing can be individuated with respect to sounds. Perhaps this is a more plausible account of the essential relation between a mode of perception and a particular set of characters of experience.

The previous section showed how difficult it is to individuate sensory modalities by reference to the character of experience alone. The character of experience is not a sufficient condition for the individuation of a sensory modality because relations other than the relations listed in the previous paragraph exist. Characters of experience are enabled by properties other than those that they are usually enabled by when sensory organs (or the brain) function in a way they were not designed to. If the character of experience is not sufficient for the individuation of a sensory modality is it necessary? Is it necessary that visual experiences have the characters they do and is it necessary that auditory experiences have the characters

they do? In other words, would it be possible for creatures relevantly similar to us to hear colours or to see sounds?

To talk of what is possible naturally requires keeping track of what we are talking about. We need to know what we are referring to when we say that something is possible. According to Kripke a term is a rigid designator if it refers to the same thing in all possible worlds. (This does not require that objects exist in every possible world.) A term is a nonrigid designator if it does not refer to the same thing in all possible worlds.<sup>24</sup> Essential properties of things are properties things have in every possible world in which they exist. Non-essential properties of things are properties things lack in some other possible world in which they exist. If perceptual processes are to be thought of as existing in other possible worlds terms such as 'seeing' and 'hearing' should be construed as rigid designators; we should refer to the same kinds of processes in every possible world in which the processes exist.

According to Kripke, we may originally distinguish a natural kind by the salient properties possessed by its members. We may then fix the reference of our natural kind terms by means of descriptions of these salient properties. But it may turn out that these properties are only contingent properties of the kind in question. Since natural kind terms should refer to the natural kind in all possible worlds where they exist, the name cannot be equivalent to the description. In the case of light, it was probably originally identified by the characteristic internal visual impressions it produced in us, that made us able to see. And its reference was initially fixed by some related description.<sup>25</sup> However, we might have been insensitive to light (it is a fact that some people are blind), so 'light' cannot be synonymous with the description, which was once used to fix the reference. It seems credible that this model can be extended to what enables our perception by other sensory modalities. Kripke points out how heat is something which we have identified (and something for which we have also fixed the reference of its name) by its producing a certain sensation in us, which we call 'the sensation of heat'.

Can we apply the model of natural kind terms to terms for modes of

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<sup>24</sup> Kripke 1980: 48-9.

<sup>25</sup> Kripke 1980: 129.

perception? It may be that we fix the reference for 'seeing', for instance, by pointing to the specific processes one is undergoing right now with regard to a specific type of perceptual organ. A parallel type of reference fixing can be achieved with respect to 'hearing'. Or it may be that we fix the reference of 'seeing' by pointing to the specific process one is undergoing right now with regard to a visible property of an object. A parallel type of reference fixing can be achieved with respect to 'hearing' and audible properties. Once fixed 'seeing' and 'hearing' can be regarded as rigid designators if they named the same kind of processes in every possible world.

According to Kripke's model it might turn out that the initial features used to fix a reference are contingent properties. How might this be so with respect to perceptual modalities? There are further reasons to think that seeing is possible only where there are eyes to see and hearing is possible only where there are ears to hear. (Clearly, the reverse is not the case: it is not an essential property of an eye to see, for one might have been born blind and it is not an essential property of an ear that one hear, for one might have been born deaf.) And there is less reason than one might have thought to believe that it is an essential property of seeing and hearing that they be related to the visible and audible properties of objects they are actually related to, namely colours and sounds respectively.

Of course, perception, more generally, is possible only where there are material objects to be seen and heard. It seems implausible to think that perceptual processes could occur in a world in which there were no material objects only disembodied beings which could perceive. But this does not mean that if there were a world in which there were material objects and disembodied beings which could perceive there would be distinctive perceptual processes with respect to these material objects which would constitute the perceptual modalities. We would surely resist the view that a disembodied being sees or hears material objects in virtue of the distinctive contents of its experience (even if it makes sense to say that it perceived those objects). Although we should acknowledge that objects of perception are necessary for perception, it is still not clear whether specific objects of perception are enough to distinguish modes of perception.

It might be argued that sensory modalities could be distinguished in virtue of the perceptible relations between visible properties on the one hand and audible properties on the other hand. Visible properties can occlude each other but not audible properties. Audible properties can mask each other but not visible properties. The way visible properties only occlude each other (lines of sight) and audible properties only exclude each other demonstrates that visible properties and audible properties are differently related to the same subject of perception. Is this not enough to talk of a different mode of perception? The trouble with this response is that there are some visible properties, which do mask audible properties; baffle-boards mask sounds and they are visible. It is not clear that a mode of perception can easily be reduced to relations between perceptible properties. More difficult still is that there are some perceptible properties which are so in virtue of related physical features nevertheless they are perceived via different sensory modalities, e.g. seeing and perceiving infra-red radiation and hearing and touch.

Grice gives other reasons for thinking that the senses cannot be individuated by reference to the perceived properties of objects alone.<sup>26</sup> In particular there is the difficulty of distinguishing vision and touch by means of the perceived shapes of things without referring to the particular character of experience of each sensory modality. Various ways of getting around the problem by introducing properties only perceived by each sensory modality are rejected by Grice. He further argues that reference to sensory organs may not be sufficient for the individuation of a sense.<sup>27</sup> Martians might have two similar sensory organs, which we would otherwise think of as enabling sight. But we would have to reconsider our original thought that these sensory organs both enabled vision if different characters of experience were produced thereby. It might be argued that Grice is simply assuming what he sets out to prove by claiming that such a creature would have different characters of experience. We might think that we can imagine such a creature but what reason have we to think that we really have imagined such a creature or if we can imagine such a creature whether it is indeed metaphysically possible?

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<sup>26</sup> Grice 1962: 136-40. The purpose of Grice's paper is to show the necessity of a number of criteria in the individuation of a sensory modality. See section 4.5.

<sup>27</sup> Grice 1962: 146-52.

Reference to perceptual organs is required to conceive the possibility of perceiving by one sensory modality what is actually perceived by another sensory modality. We see colours. In order for it to be possible to hear colours we must refer to auditory organs; only they can make the relevant difference. If it is possible to perceive by one sensory modality what is actually perceived by another sensory modality we have further reason to doubt the view that modes of perception can be individuated without reference to organs of perception.

Given the constitution of the actual world we can see colours and shapes only because of the way external stimuli, to which we know colours are somehow related, interact with our visual organs. A similar story applies to our hearing sounds. We can hear sounds (and such creatures as bats can perhaps hear shapes) only because of the way external stimuli, to which we know sounds are somehow related, interact with our auditory organs. The metaphysical possibility of hearing colours and seeing sounds seems to rest on two possibilities. Consider the following scenario outlined by Kripke:

Perhaps we can imagine that, by some miracle, sound waves somehow enabled some creature to see. I mean, they gave him visual impressions just as we have, maybe exactly the same color sense. We can also imagine the same creature to be completely insensitive to light (photons). Who knows what subtle undreamt of possibilities there may be? [...] It would be a situation in which certain creatures, maybe even those who were called 'people' and inhabited this planet, were sensitive not to light but to sound waves, sensitive to them in exactly the same way that we are sensitive to light. If this is so, once we have found out what light is, when we talk about other possible worlds we are talking about this phenomenon in the world, and not using 'light' as a phrase synonymous with 'whatever gives us the visual impression - whatever helps us to see'; and even something else might have helped us to see.<sup>28</sup>

Kripke is mainly interested here in naming and necessity, what we refer to by the term 'light' in possible worlds. But his discussion rests on some suggestions about perceiving and possibility. These suggestions can be made more explicit in two ways. The first is the possibility of auditory organs and visual organs being differently related to features of the external world. In this way lightwaves might impinge on auditory organs and enable auditory processes (hearing colours) or soundwaves might

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<sup>28</sup> Kripke 1980: 130-1.

impinge on visual organs and enable visual processes (seeing sounds). The second possibility is one in which auditory organs and visual organs are related to features of the external world in the way that they are actually related with one exception; sounds are related to lightwaves in the way that colours are actually related to lightwaves (seeing sounds) and colours are related to soundwaves in the way that sounds are actually related to soundwaves (hearing colours).

As for the first possibility, that of auditory organs and visual organs being differently related to features of the external world: is it possible for lightwaves to impinge on auditory organs (and underlying systems) and thus to enable the hearing of colours or for soundwaves to impinge on visual organs (and underlying systems) and thus to enable the seeing of sounds? If these were possible would we call these cases of hearing colours and seeing sounds? There seems little reason why we should not think and talk of these as genuine cases of hearing colours and seeing sounds. If it is plausible to think that 'hearing' and 'seeing' can be considered *de jure* rigid designators then the presence of what constitutes colours and sounds in such a possible world should provide the grounds for deeming these cases of hearing colours and seeing sounds respectively. But are the respective relations metaphysically possible?

Is it plausible that soundwaves could be appropriately related to the visual organs and lightwaves could be appropriately related to the auditory organs? One way of supporting the view that 'hearing' and 'seeing' can be considered *de jure* rigid designators is if organs of perception are construed as members of a natural kind; all eyes would be members of one natural kind, all ears would be members of another natural kind.<sup>29</sup> Science has taught us that one of the properties of the molecules, which compose standard examples of eyes is to react to photons in a particular way. Different types of eyes may look different and function differently (think of compound eyes) but they all possess molecules, which have the capacity to transduce lightwaves. It would be difficult to resist the notion that, if eyes had essential properties, one essential property of eyes would be the property of having molecules, which can only

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<sup>29</sup> The idea would be made not immediately implausible by considerations similar to those developed in chapter two. Different species have very different eyes, but there are nevertheless features which make all of them eyes. Something related can be said of auditory systems.

be appropriately modified by photons of light. Just as photons have essential properties, which are manifested in the basic laws of nature, so the physical components of eyes (any possible eye) likewise necessarily have certain physical properties, which are also manifested in the basic laws of nature. If such a constraint on the essential properties of the kind 'eye' is accepted then it follows that soundwaves would not be able to cause the retina to emit signals of the appropriate nature. On this reasoning, it is impossible that eyes could transduce soundwaves in the way that it is impossible that photons could have electric charge or rest mass or spin. The same considerations can be adduced for the cochlea and lightwaves; it is impossible that ears could process lightwaves. This view simply resists the suggestion that soundwaves could have the requisite properties, say energy levels, to modify the components of eyes appropriately. Only photons have such properties. If we think of fundamental physical features as having essential properties, it is natural to extend this to whatever those properties are nomically related to.<sup>30</sup> Indeed it is for those who believe in the possibility of hearing colours and seeing sounds in this way to argue for a difference between the laws of nature. We cannot see soundwaves and we cannot hear lightwaves. In this sense, we could neither see sounds nor hear colours.

The second possibility of hearing colours and seeing sounds is the converse of the possibility, which has previously been rejected. That possibility was the possibility that soundwaves could produce experiences of colour via hearing. But that was rejected as a case of hearing colours for conceptual and not for metaphysical reasons. Even if this scenario were to occur it would be neither a case of hearing colours nor a case of seeing sounds for the reason that neither colours nor sound exist independently of the act of perception. But the metaphysical possibility of this scenario has not been considered properly.

There are two obvious ways in which this scenario might be realised. The first way is expressed by Robinson who writes: 'The real thought is that the same stimuli could give rise to different experiences if they had been associated with different neural structures. If, for example, the human eye had been connected to those centres

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<sup>30</sup> Intuitions might divide at this point. It might be found more plausible that soundwaves could interact with visual organs than that that lightwaves could interact with auditory organs.

which are in fact associated with hearing, light would have given us sound experiences'.<sup>31</sup> Robinson points out that it is not clear that if neural structures were so connected then we would have experiences as we actually have when we hear, for the underlying neural structures might in this case then be dedicated to selecting information about colours and represent them in the way that our visual experience actually does. The idea is that the plasticity of the brain would allow different structures to represent the same features of objects. (Of course, if some sort of neural switching were to take place our intuitions about what will happen in the circumstances are likely to vary.)

One reason why the possibility of sounds enabling experiences of colours seems to be a coherent one is that there seems to be no reason why different kinds of stimuli should not be relevantly equivalent. It might be claimed that there is a lack of isomorphism between the actual transduction of soundwaves into neural signals and the actual transduction of lightwaves into neural signals by the retina, and therefore the one type of stimuli could not produce experiences as of the other type of stimuli. That may actually be the case. But there may be possible worlds in which the effects of the two types of stimuli are not so different.

To motivate the view we would have to imagine both the physical world and the respective sensory systems to be structured differently from how they are actually structured. We can hear the sounds of objects which we cannot see and we can see objects which we cannot hear because of the nature of light and soundwaves and how they interact with visible and audible items. Relatedly our visual fields and auditory fields have different spatial extensions: we can only see in front and slightly to the side of us, whereas we can hear all round us. Presumably all of this will require an equivalent difference in the ultimate neural representations. The world and our perceptual systems would have to be arranged appropriately to compensate for the actual differences between seeing and hearing. But both of these features seem contingent. In fact the ears of a bat are so designed as only to hear things in front of it, whilst the eyes of the hammerhead shark are so designed as to be able to see all around it at once. Such creatures indicate that sensory stimuli perceived via different

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<sup>31</sup> Robinson 1993: 69.

sensory modalities can be equivalent. In the natural world different sensory modalities have evolved to fulfil similar functions in different creatures.

The equivalence of different stimuli is a well-articulated position in the psychology of perception. According to such a view, perception is based on the detection of invariant information such as optic flow fields in the case of vision, and ratios and rates of divergence in acoustic fields in the case of hearing. The equivalence of different stimuli means that the stimulus information may be identical when stimuli are different.<sup>32</sup>

What lies behind the present possibility is the claim that the character of experience supervenes on local physical properties. Such a claim can be put in the following way. A and B are two families of properties. A supervenes on B iff necessarily for any property F in A, if an object has F, then there exists a property G in B such that x has G, and if any y has G it also has F.<sup>33</sup> Consider creatures which see colours. A is the family of colour experiences and B is the family of local neural states of the visual system. Colour experiences supervene on local states of the visual system iff necessarily for any colour experience if a creature has that colour experience then there exists a state of the visual system such that the creature possesses it and any other creature which possesses that state of a visual system will have an identical type of colour experience. According to Robinson if the brain were rewired then light stimuli would produce experiences of sounds and sound stimuli would produce experiences of colours. A partial version of this idea is manifested in synaesthesia.

But the supervenience relation so defined above is a weak supervenience relation. In another possible world the family C, containing the experiences of sound, might supervene on the family of properties B. C supervenes on B iff necessarily for any property H in C, if an object has H, then there exists a property G in B such that x

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<sup>32</sup> See Gibson 1966: 55. Gibson offers the example of fire. It is the source of four kinds of stimulation. The flames of the fire can be seen, the sounds it makes can be heard, the smoke it gives off can be smelt and the heat it radiates can be felt. Gibson claims that as far as the perception of the fire is concerned the four kinds of stimulus information and the four perceptual systems are equivalent.

<sup>33</sup> See Kim 1993: 64.

has G, and if any y has G it also has H. The claim may not be attractive. But it may have some plausibility if different sensory stimuli, lightwaves and soundwaves, are equivalent. If they are equivalent then what distinguishes them, might depend on local physical states: what makes the difference between experiences of colour and experiences of sound are local physical states that realise them.

But was not most of chapter three spent supporting the rejection of the idea that the phenomenal character of experience supervened locally? If this weak supervenience claim is to be doubted with respect to it being a *local* supervenience claim then why not countenance a third supervenience claim: in a possible world colours could supervene on soundwaves.<sup>34</sup> If the colours were themselves so related to soundwaves then the conceptual objection would no longer apply. If soundwaves could produce experiences of colour, and the colours could exist independently of the subject's perception of them then it would be possible to hear colours. It is just contingently false that we do so. Few would accept either the second or the third supervenience claim, for the reason that they are *weak* supervenience claims. But the reasons we have for rejecting them are neither conceptual nor immediately given. They are the result of other claims about the relationship between the mental and the physical. And it would be for these reasons that we rule out the possibility of hearing colours or seeing sounds.

#### 4.4 Can Hearing be Coloured?

It could be that the reason for rejecting the locution of 'hearing colours' lies more with one of the purported *relata* rather than the other. The reasoning of 4.2 might suggest that the fault lies with the use of the term 'hearing' because there are no colours external to the subject, which would allow us to count this as a case of hearing. On a neutral view of colour concepts it is perfectly acceptable to use colour terms both of properties of things, which exist independently of us, and of purported phenomena (e.g. hallucinations and memory images), which are dependent upon us

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<sup>34</sup> The view that colour is a supervenient property is discussed in Campbell 1993.

for their existence.<sup>35</sup> We do not similarly use the term 'hear' to refer to a perceptual relation with what exists and with what only seems to exist; the term 'hearing' is supposed to mark just that distinction. However, our evidence also suggests that the additional experience the synaesthete has as of colours is enabled by the sound, which is heard; the colour is experienced because the sounds are heard. The results of earlier considerations can be summarised as follows: colours are not heard, but hearing enables an experience as of colours, and we should be neutral about whether this is a visual experience. Another way of referring to the experience of colour which some synaesthetes have when they hear and which accommodates all of these considerations is required.

It might be wondered why we need to be concerned about the way we talk about such experiences. After all synaesthesia is a rare condition and we have a technical term, 'synaesthesia'. Does synaesthesia really tell us anything about the way we talk of the senses? Perhaps we should think of synaesthetic experiences (of a particular sort) simply as involving coloured visual images involuntarily produced by hearing a sound, because, in some respects, the imagery shares some properties with visual images. But the point is that, in other relevant respects, it is not comparable to a visual image; synaesthetic experience seems to be caused by external features and thereby it seems different from visual images we might conjure up ourselves. Following the previous reasoning, why then should we not think of a case of normal hearing as an auditory image of, for instance, a sound involuntarily produced by hearing that sound? In the end though, since how we talk about our standard perceptual experiences is a topic of interest to philosophers, surely any unusual form of experience, such as synaesthesia, which can be used as a test of theories about how we talk of perceptual experience more generally, should be of interest to us.

One alternative terminology - 'hearing coloured sounds' - can be quickly dismissed. There is a surface similarity between the locutions 'hearing coloured sounds' and 'seeing coloured objects'. Even if one were to hold a view of colour in which colours were not properties of objects but of our responses to stimuli from

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<sup>35</sup> See Kliewer 1998 for a defence of neutral colour concepts.

objects, one would still want to mark the difference between experiences of colours when seeing objects and experiences of colours when hearing objects. For there is nothing about the coloured light, which suggests that sounds could be coloured in the way objects could be. The superficial similarity of the locutions suggests that there is. The problem is that there seems to be no obvious way of removing this surface similarity by an analysis of underlying form.<sup>36</sup>

Another alternative terminology is that of 'coloured hearing'. This locution also challenges our ordinary usage. Is hearing something which can have the property of being coloured? This is not a metaphorical way of speaking, as when we say that our judgement is coloured. Wittgenstein talks about primary and secondary senses of words and, in one case, he might even be talking about synaesthesia:

Here one might speak of a 'primary' and 'secondary' sense of a word. It is only if the word has the primary sense for you that you use it in the secondary one. The secondary sense is not a 'metaphorical' sense. If I say 'For me the vowel e is yellow' I do not mean: 'yellow' in a metaphorical sense - for I could not express what I want to say in any other way than by means of the idea of 'yellow'.<sup>37</sup>

Seeing would seem to be a more likely candidate for being coloured and yet we do not think of seeing as having the property of being coloured; we think of objects rather than perceptual processes as being coloured.

I want to suggest that a reason for us to adopt the terminology of 'coloured hearing' can be found in the adverbial theory of experience. For the adverbial theory was intended as a way of uncovering the underlying metaphysical commitments in our talk of appearances in both perceptual processes and quasi-perceptual processes (processes like after-imaging and hallucinating which have in some respects the phenomenal character of perceptual processes) by translating our surface locutions into other locutions. These further locutions would usually not be retained in ordinary usage but could be recovered if the need arises, to show the metaphysical commitments involved or not involved in our ordinary usage. Synaesthesia clearly has

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<sup>36</sup> This is not to deny that synaesthetes may nevertheless sometimes use this way of speaking, and do so non-metaphorically, as can be seen from Cytowic 1989: 1, 'What first strikes me is the colour of someone's voice. (x) has a crumbly yellow voice, like a flame with protruding fibers. Sometimes I get so interested in the voice, I can't understand what's being said.'

<sup>37</sup> Wittgenstein 1953: II xi: 216.

elements of both perceptual processes and quasi-perceptual processes. Perhaps the locution of 'coloured hearing', which has features in common with these further locutions, retains them in ordinary usage.

The adverbial theory of perception was developed as a way of explaining our ordinary talk of appearances in perceiving. We move with respect to objects and objects move with respect to us. And conditions which enable us to perceive objects are variable. It is for these and similar reasons that we talk of objects appearing in particular ways to us, such as: 'x appears F to S' (where x denotes an object, F denotes a perceptible property such as colour and S denotes a perceiving subject).<sup>38</sup>

According to the view outlined by Price, that objects appear in certain ways involves an unanalysable two-place relation between an object, or the surface of an object, and a subject:

Now the same top surface of a certain penny stamp may appear to me pink and to a colour-blind man grey, to me lozenge-shape and to him trapeziform, while in itself it is square and (perhaps) colourless. Of course the same entity cannot be at once red and grey and colourless, trapeziform, lozenge-shaped and square. But then it does not have to be. For though being trapeziform is incompatible with being lozenge-shaped, yet appearing trapeziform to A is perfectly compatible with appearing lozenge-shaped to B - and with being intrinsically square. So, appearing grey to B is compatible both with appearing pink to A and with being intrinsically colourless.<sup>39</sup>

But, since F can occur in other contexts than appearing, it does seem more reasonable to construe 'x appears F to S' as a three-place relation between an object, or the surface of an object, a property and a subject. But when we construe the relation in this way there is a natural temptation to further construe it such that there is something - an appearance - which an object presents and that therefore is a certain way. The suggestion is as follows:

(1) We should read 'x appears F to S' as 'x presents an F appearance to S'.

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<sup>38</sup> The idea that objects appear in certain ways can be found in Price 1932: 62-4 and also, as the relational theory, in Robinson 1993: 48-50. Ducasse 1942 originally argued for an adverbial construal of sensory experience against Moore's sense-data theory. Ducasse argued that an act-object account of sense-data would entail the unobserved existence of sense-data. For developments of adverbialism see Chisholm 1957: 115-25, Sellars 1974 and Tye 1985.

<sup>39</sup> Price 1932: 62.

In (1), since the appearance is not identical with a property of the object, the appearance can then be understood as an F sense-datum which S has. According to the adverbial theory there is a better reading which eschews all talk of appearances:

(2) We should read 'x appears F to S' as 'S perceives (sees, hears etc.) F-ly (with respect to) x'.

Two perceptual acts where the object appears differently to S (say, one in standard and one in non-standard conditions, whatever they might be) are, according to this analysis, on a par. The object is perceived in both instances, although in different ways.

Some accounts use the term 'senses' or the term 'experiences' in the analysis of 'x appears F to S'. Instead of sensing or experiencing a peculiar intermediate object such as a sense-data, a subject senses or experiences in a certain manner. The difference between veridical and non-veridical sensings or experiences, and between non-veridical sensings or experiencings, such as hallucinatings and afterimagings, is for such accounts then clarified by reference to the object (x), or the causal factors, which enable the respective sensings for S.<sup>40</sup> This may be possible, but it seems easier to draw the distinction between types of veridical experiences and types of non-experiences in the predicate rather than the specific causal provenance. It is certainly easier when an analysis of synaesthesia is reached. This explains why the specific modes of perception have been made explicit in (2). It should of course be assumed that modes of perception and types of non-veridical processes are, for the purposes of this analysis, just specifications of sensing or experiencing. And, it might be emphasised, this modification does not imply that the subject who is perceiving is always able to discriminate between their states of perception and some other sensory or experiential states, such as hallucination.

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<sup>40</sup> Chisholm 1957: 120 uses the term 'sense' to carry through his analysis of perception. So someone would sense blue-ly with respect to something. Tye 1984 uses the term 'sense' to carry through his analysis of afterimaging. So someone would sense yellow-ly.

The question naturally arises as to how we should understand 'S perceives (sees, hears etc.) F-ly with respect to x'. Tye proposes that there are two main ways of further analysing the adverbial form: the structured predicate theory and the event predicate theory.<sup>41</sup>

The structured predicate theory claims that adverbs are operators which turn the predicates they modify into different predicates. The sentence thus retains its subject-predicate form. Adverbs stand for functions that map the properties or relations expressed by the predicates they modify onto other properties or relations. In other words, an adverb turns one verb phrase into another more complex verb phrase. Thus the adverb 'F-ly' operates on the basic perceptual relation:

(3) We should read 'S perceives (sees, hears etc.) F-ly (with respect to) x' as 'S and x instantiate an F-ly-perceptual (-visual, -auditory etc.) relation'.

It is not clear that this reading really enlightens us in any way about the metaphysics underlying appearances in perception.

The event predicate theory claims that statements about the manner in which people perceive are statements about particular events. On this theory there is a hidden quantification in the adverbial form:

(4) We should read 'S perceives (sees, hears etc.) F-ly (with respect to) x' as 'There is an event e such that S and x undergo e and e is a perceiving (seeing, hearing etc.) -F-ly'.

Adverbs are then best understood as predicates, which are true of these events:

(4') We should read 'There is an event e such that S and x undergo e and e is a perceiving (seeing, hearing etc.) -F-ly' as 'There is an event e such that S and x undergo e and e is a perceptual (visual, auditory etc.) event having the property of F-ly-ness'.

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<sup>41</sup> Tye 1984 & 1996. Tye 1984 dismisses a first preliminary way which would view this locution as an unstructured predicate because it fails to resolve issues raised by the identity of images and the many-properties objection discussed in Jackson 1977.

How are we then to understand the property of F-ly-ness? It should be emphasised that a sensible property is not being predicated of the perceptual event. Something in the manner of a sensible property is being predicated of the perceptual event *e*. A modified term for a sensible property is being used to denote a specific, as yet unexplained, type of property of this kind of event. The reference to sensible properties, such as red and square, would have an extended sense introduced by the adverbial analysis of 'red-ly' and 'square-ly'. An adverbial analysis makes us focus upon what the extended sense might be, for this extended sense should explain the notion of 'in the manner of' introduced by the adverbial analysis. Tye suggests that it should be construed as perceiving with the F (e.g. red and square) qualitative character.<sup>42</sup> The property of F-ly-ness could also be construed as the representational property as of F, or, alternatively, the property of being represented as of F. The sense is extended in so far as we are not talking about the property red, but a representation of the property red. These two interpretations are not incompatible.

The application of adverbial theories, dealing as it does with appearances, has been extended from perceptual experiences to a family of quasi-perceptual experiences. (Some adverbialists seem to focus only on quasi-perceptual experiences.) Hallucinations and afterimages both figure as experiences which seem, in certain respects, like perceptual experiences. Here the purported appearances are non-veridical, so it might be claimed, obviously mental appearances. The adverbial theory can express a denial of appearances in quasi-perceptual processes by replacing a perceptual term with a quasi-perceptual term:

- (5) We should read 'x appears F to S' as 'S quasi-perceives (afterimages, hallucinates etc.) F-ly (with respect to) x'.

In the case of veridical experiences 'x' stands for an object of perception; the object is perceived in different ways. In the case of non-veridical experiences, 'x' stands for a purported object of non-veridical experience; 'x' is supposed to refer to an after-image or an hallucination or an object which does not exist but which nevertheless seems to exist and seems to appear F to S. According to the adverbial reading there is

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<sup>42</sup> This paper was written before Tye developed a representational theory of perceptual experience.

no such thing as an afterimage or a hallucination or an object, which does not exist. This is reflected in the use of a term referring to a quasi-perceptual process. The existence of objects of quasi-perception are not entailed by quasi-perceptual processes.<sup>43</sup>

How is this reading to be further analysed according to the two versions of the adverbial theory? According to the structured predicate theory, adverbs are operators which turn the predicates they modify into more complex predicates. The difference between perception and quasi-perception is marked by the difference between the instantiation of a relation and of a property. So the modification of the predicate from 'quasi-perceives' to the more complex predicate 'quasi-perceives F-ly' represents the predication of a more complex property:

- (6) We should read 'S quasi-perceives (afterimages, hallucinates etc.) F-ly' as 'S instantiates an F-ly-quasi-perceptual (-afterimagery, -hallucinatory etc.) property'.

Once again it is not clear that this reading really enlightens us about the metaphysics underlying appearances in perception.

According to the event predicate theory there is a hidden quantification and the adverb functions as an adjective, which applies to the event signified by the predicate 'quasi-perceives'. Note that in this rendering there is no reference to an object *x*:

- (7) We should read 'S quasi-perceives (afterimages, hallucinates etc.) F-ly' as 'there is an event *e* such that S undergoes *e* and *e* is a quasi-perceptual (afterimaging, hallucinatory etc.) event having the property of F-ly-ness'.

In keeping with earlier ideas, when we predicate a colour of an after-image or an hallucination, we are predicating a more complex property of an event of afterimaging or hallucinating than we do when we predicate a colour of an external object; we are predicating something in the manner of a colour of a quasi-perceptual event. The

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<sup>43</sup> Presumably an analysis which did not explicitly specify the state of mind would have to do so implicitly by reference to the specific enabling causal factors in the cases of perceptual and quasi-perceptual states.

references to sensible properties, such as red, has an extended sense introduced by the adverbial analysis of 'red-ly'. This, again, is consistent with the view that the properties are representational properties. When we talk of experiencing a red image we should recognise that we are using an extended sense of the term 'red', for the context is intensional. It is not that there is a red object (a red image), but a representation of properties of objects, in this case the representation of the property red. Lycan argues similarly for an adverbial analysis. His view is that an adverbial analysis can be read colloquially by inserting an 'as if' construction': someone having a green afterimage would be sensing as he would be sensing if a green patch were present. This forms a topic-neutral translation, which Lycan argues can be understood by any standard semantics for counterfactuals. He further argues that this does not conflict with, but rather leads to, the view that afterimages can be construed in intentional terms:

I take the view that phenomenal individuals such as sense-data are intentional inexistents à la Brentano and Meinong. It is, after all, no surprise to be told that mental states have intentional objects that do not exist. So why should we not suppose that after-images and other sense-data are intentional objects that do not exist?' Thus we can consistently admit that 'phenomenal-color properties qualify individuals without granting that there exist individuals that are the bearers of phenomenal-color properties'.<sup>44</sup>

The pieces are now in place for justifying the use of the terminology of 'coloured hearing' as a way of talking about synaesthesia. It was claimed at the beginning of this section, with respect to the form of synaesthesia exemplified by Scriabin, that colours are not heard, but hearing enables an experience as of colours, yet this may not be a visual experience. What needs to be incorporated into an analysis is the thought that synaesthesia is a perceptual process with quasi-perceptual features.

Following the earlier analyses of perceptual and quasi-perceptual experiences, (2) and (5) above, the following adverbialism can be considered:

(8) We should read 'x appears F and y appears G to S' as 'S perceives (sees, hears etc.) F-ly (with respect to) x and quasi-perceives G-ly (with respect) to y'.

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<sup>44</sup> Lycan 1987: 88.

In the original way of speaking 'x' and 'y' are both subjects of the same type of predicate. In the analysis 'x' and 'y' are each objects of different types of predicates; the first is existence-entailing, the second is not. Perhaps, in the synaesthetic experience of colour, the object x appears to be both F and G to the subject S. No matter, the distinction between perception and quasi-perception should still be drawn, for this is not a process of perceiving two perceptible properties, both the F and G, of x.

How is this analysis to be further interpreted in terms of the alternative theories of adverbialism? A consideration of synaesthesia might even offer its own grounds for preferring one account of the adverbial theory over the other. Consider firstly the structured predicate theory. Since the adverbial modifiers turn the respective predicates into more complex predicates:

- (9) We should read 'S hears F-ly (with respect to) x and quasi-perceives G-ly' as 'S and x instantiate an F-ly-auditory relation and S instantiates a G-ly-quasi-perceptual property'.

One problem with this analysis is that a term to characterise a distinctive form of quasi-perception is now required. As with cases of hallucination and afterimaging, a term would be required to denote the distinctive property a synaesthete instantiates. In the case of synaesthesia it seems more plausible to relate the quasi-perceptual process with the auditory process since that process causes it. (An analysis in terms of causal provenances would have to individuate the process in terms of the sound of the object.) So it is not clear that the logical apparatus the structured predicate operator theory employs makes the analysis possible, let alone easy.

The event predicate theory offers a richer logical structure, which, in turn, presupposes a richer metaphysical interpretation:

- (10) We should read 'S perceives (sees, hears etc.) F-ly (with respect to) x and quasi-perceives G-ly' as 'S and x undergo a perceptual event having the property of F-ly-ness and S undergoes a quasi-perceptual event having the property of G-ly-ness'.

The problem still remains of having to characterise the type of quasi-perceptual event. But what is to make us think that there are two events here. One might individuate a quasi-perceptual process in terms of what causes it. (This might be the way one would characterise an after-image.) Here the quasi-perceptual experience is caused by what causes the veridical experience. If this is so then maybe only one event is taking place. Of course the synaesthetic experience has a different phenomenal character from the veridical experience; then the event has two properties. Thus:

(10') We should read 'S perceives (sees, hears etc.) F-ly with respect to x and quasi-perceives G-ly' as 'S and x undergo a perceptual event having the properties of F-ly-ness and G-ly-ness'.

Under one interpretation, S and x undergo an event of hearing having the properties of F-ly-ness (perhaps B-flat-ly-ness) and G-ly-ness (perhaps coloured-ly-ness). In other words, S undergoes an event of coloured hearing with respect to an audible property. We are able to reflect the view that hearing enables an additional experience as of colours. We are able to reflect the view that this is neutral with respect to whether it is a visual experience, for any mention of seeing has been excluded. Yet we are able to reflect the quasi-perceptual features by the instantiation of a second property, similar to those we predicate of quasi-perceptual events, but here, which are more appropriately attributed to another mode of perception.

Furthermore, pursuing an adverbial analysis is a way of clarifying the point that the sense of the term 'coloured' in 'coloured hearing' is extended. Hearing is not literally coloured, or, at least, it is not coloured in the way that we think of objects as being coloured. It is *in the manner of* being coloured, that is to say, the event involves the representation of something as being coloured which, in this case, turns out not to be coloured.<sup>45</sup>

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<sup>45</sup> Interestingly, Cytowic does use the terminology of 'geometric tasting' interchangeably with that of 'tasting shapes' to describe MW's synaesthesia. I hope the discussion has shown that there is reason to think that they are not interchangeable; synaesthete's, like MW, do not taste shapes, but they may have geometric taste. After all, some creatures might be able to perceive shapes by taste, or at least, which is very close, by smell.

However it would follow from this analysis that we should construe seeing as coloured too. Seeing would only be 'coloured' in the extended sense, introduced by the adverbial analysis, of representing properties to be a certain way. We do not talk of 'coloured seeing' even though this may explain the representational features involved in seeing because ordinary usage rightly requires that we emphasise the perceptual properties that are veridically represented when we see the colour of some item. Ordinary usage would not demand this of coloured hearing because there are no equivalent perceptual properties being veridically represented. To talk of 'coloured hearing' is to emphasise the non-veridical nature of synaesthesia. In the same way to talk of 'coloured seeing' would be to emphasise the non-veridical nature of a different form of synaesthesia whereby visible properties enable additional colour experiences.<sup>46</sup>

#### *4.5 Some Further Remarks on the Senses*

In section 4.2 there was little support found for the suggestion that the representation of modes of perception accompanies the representation of properties of objects perceived via different modes of perception. That is to say, there was little support found for the suggestion that a representation of something coloured is represented, in the same process, as a visual experience and similarly whether a representation of something noisy is represented, in the same process, as an auditory experience. In 4.2 it was accepted that the first would constitute a visual experience, and that the second would constitute an auditory experience and that we can and do then conceptualise them as a visual experience and an auditory experience respectively.<sup>47</sup> In other words although the phenomenal character of experience is often enough for us to distinguish between the senses, it is not always a sufficient condition; an experience of colour and

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<sup>46</sup> One difficulty for the analysis might arise in the case of coloured seeing: 'How does one differentiate the use of the term 'coloured' when veridical and when non-veridical?' But it should be recalled that the representational view of perceptual experience emphasises that the sense of the representation does not determine the reference. This is how it should be.

<sup>47</sup> It may be that we do represent to ourselves modes of perception non-conceptually. This would not be via the properties of objects represented but via the representation of properties of organs of perception, as was argued in section 3.3.

shape is not always a visual experience. 4.3 pressed the point by suggesting that a distinctive phenomenal character of experience may not be a necessary feature of a particular mode of perception and by arguing that our reasons for rejecting the possibility of hearing colours and seeing sounds would be other than those provided by the character of our actual perceptual experience. The focus of this section is the way the various criteria of a sensory modality are combined in the individuation of that sensory modality.

Coloured hearing bears upon the issue in so far as it suggests that there is nothing intrinsic about the character of an experience, which informs us of its perceptual modality. Certainly, in so far as they are in the main equivocal, the self-reports synaesthetes offer of their coloured hearing experiences tend to support the view that their anomalous experiences of colours and shapes are not intrinsically visual experiences. Whether these are represented as visual experiences will depend upon criteria other than those intrinsic to the phenomenal character of the experiences. The interpretation of 'coloured hearing' in the previous section left little opportunity for the characterisation of the anomalous features of the synaesthetic experience as representing a distinctive modality. If this adverbial reading of synaesthesia is to stand, the view that modes of perception are not given or represented in the character of experience needs to be supported.

The issue relates to some influential remarks Grice made about the senses.<sup>48</sup> Grice discussed how a number of features we take to be marks of the perceptual modalities are related to each other by asking why we might think of a newly discovered faculty actually to be that of a familiar perceptual modality. After outlining some reasons for thinking a faculty would not constitute a faculty of perceiving he claimed that the criteria of perceptual modalities are of four sorts.

Firstly the senses are to be distinguished by the differing features that we become aware of by means of them: that is to say, seeing might be characterised as perceiving things as having certain colours, shapes and sizes; hearing as perceiving things as having certain degrees of loudness, certain determinates of pitch, certain tone-qualities; and so on for the other senses. A perceptual experience would be a

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<sup>48</sup> Grice 1962.

visual experience if it enabled someone to become aware of the colours of the objects in their vicinity. A perceptual experience would be an auditory experience if it enabled someone to become aware of the pitch of the sounds objects make.

Secondly two senses, for example, seeing and smelling, are to be distinguished by the special introspective character of the experiences of seeing and smelling; that is, disregarding the differences between the characteristics we learn about by sight and smell, Grice suggests that we are entitled to say that seeing is itself different in character from smelling.

Thirdly, the senses are to be distinguished by the differing general features of the external physical conditions on which the various modes of perceiving depend. They can be differentiated by reference to the distinct stimuli connected with the different senses: the sense of touch is activated by contact, sight by light, hearing by sound waves, and so on. The importance of this criterion has been reinforced in the thought experiment of section 4.3.

Fourthly, the senses are to be distinguished by the internal mechanisms associated with the various senses - the character of the sense organs and their mode of connection with the brain. The importance of this criterion has already been reinforced in the earlier discussion in section 4.2 of how we are to understand synaesthesia.

Grice notes that the criteria are not mutually exclusive and that we are likely to call on a multiplicity of criteria for distinguishing the senses. Grice observes that one procedure, which he does not broach, would have been to discuss the applicability and relative weight of these criteria in relation to difficult cases. Sections 4.2 and 4.3 can be seen as going a little way in that direction. In sections 4.2 and 4.3 the third and fourth criteria are in some conflict with the second criterion. There the phenomenal character of experience was subordinated as a criterion of the individuation of perceptual modality to other criteria, specifically organs of perception and external physical features. In section 4.2 the anomalous character of experience was, as it were, overruled by the presence of a distinctive sensory organ as a criterion for the presence of a particular perceptual modality. In the thought experiment of

section 4.3 the importance of the character of experience in the individuation of a perceptual modality was further undermined.

Grice's objective is to discuss the independence of these criteria. It has been claimed in section 4.3 that it is more difficult to maintain the independence of the third and fourth criteria than the independence of either of those criteria and the second criterion. Grice's particular target is the independence of the first and second criteria. For Grice's objections to the first criterion as a sufficient condition for the characterisation of a sensory modality see section 4.3. Grice's objections to the second criterion as a sufficient condition for the characterisation of a sensory modality concern the transparency objection and the contingency of the relation between character and features detected; these have been touched on in sections 3.2 and 4.3 respectively. On the first issue he claims that when asked to pay attention to the character of experience of a perceptual modality a description of character dissolves into a description of the features of objects we see and feel. On the second issue he claims that 'if to see is to detect by means of a special kind of experience, will it not just be a contingent matter that the characters we detect by means of this kind of experience are such things as colour and shape? Might it not have been the case that we thus detected characteristic smells, either instead of or as well as colours and shapes?'<sup>49</sup> But our perceptual experience does not seem to be like this: 'it does not seem to be a contingent fact that we do not see the smells of things'. Despite these reservations Grice's conclusion is that the second criterion seems to be independent from the first criterion, and is indispensable for telling the difference between the senses, in large part because the first criterion is insufficient and cannot be sufficiently bolstered by the other two criteria (as his Martian thought experiment is supposed to show).

This suggestion should be resisted. That it should be resisted is only to be expected. Chapters two and three explored a representational view of the mind combined with an externalism about psychological natural kinds and the phenomenal character of experience. If one takes such a view then there is no place for qualia or anything else which might individuate the senses or allow creatures such as us to tell

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<sup>49</sup> Grice 1962: 144-5.

the senses apart other than the diverse sensory organs, the differing features that we become aware of by means of them and the general features of the external physical conditions on which the various modes of perceiving depend.

Mciver Lopes has recently claimed that 'a representational theory of mind cannot individuate the sensory modalities in a principled manner'.<sup>50</sup> The present chapter has shown how a representationist view would individuate the sensory modalities in unusual cases in a 'principled manner'. If anything Lopes' claim that 'an adequate philosophical account of the senses [...] should distinguish the senses by their phenomenal character' is what is open to doubt. The senses are clearly distinguished on the basis of more evidence than that of each of the senses individually. Lopes' idea is that an ER-ist is committed to the view that the phenomenal characters of experiences are determined by their contents and yet experiences of the same content by different sensory modalities can have different phenomenal characters. ER-ists might deny that experiences of the same content had by different sensory modalities do have different characters. If they accept this then ER-ists can still explain the differences in terms of the representation of properties of sensory organs. The fact that some sensory modalities are proximal and the experiences enabled by them are informed by the mechanisms by which they are had should not provide an insuperable difficulty for ER.

A good motivation for the view that the second criterion can be reduced to the first criterion can however be found by a consideration of the distal senses: seeing and hearing. The thought is simple enough. Rather than perceiving the same property via different modalities, what would one think if the one modality could produce additional special introspective features more commonly associated with another sensory modality? It seems natural that, if we have a perceptual experience, which involves hearing something and thus the fulfilment of criteria (1)-(4) in the accepted way accompanied by an experience of colour, then we would be reluctant to regard this additional introspective feature as a feature of hearing. But we would also be reluctant to regard the additional introspective feature as being a visual experience.

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<sup>50</sup> Mciver Lopes 2000: 439.

This is because the other criteria (1), (3) and (4), which we use to individuate a visual process, are lacking here. What remains is simply an additional introspective feature. We do not represent it to ourselves as a visual experience simply because it is as of a colour and shape for it is in conflict with the other criteria. If anything we would represent it to ourselves as though it were an experience as of colour and shape.

But this extra introspective feature is, in the relevant respects (being as of colour and shape), to be classified along with the special introspective features of visual perception. But what makes a visual experience a visual experience is not simply membership of the class of experiences as of colour and Euclidean shape, but also the fact that it typically picks out certain features of the environment. Criteria (1) is accompanied by criteria (3) and (4). If one had to weigh criteria (1) and criteria (2) together in an anomalous case, such as synaesthesia, criteria (1) would surely outweigh criteria (2); in this case it is accompanied by the other criteria. Indeed, it would seem that criteria (2) has no independent significance. If we are persuaded that a perceptual modality is not represented in the phenomenal character of the anomalous experiences which synaesthetes undergo then we have less reason for thinking that perceptual modality is represented in the phenomenal character of the perceptual experiences which normal perceivers standardly undergo.<sup>51</sup>

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<sup>51</sup> A different approach might be adopted. One might ask whether any difference in phenomenal character between seeing and hearing could be adduced (and thus whether there were a character to seeing and hearing beyond that which is enabled by the features perceived) if one were in a possible world, such as was considered in 4.3, in which colours were heard.



## Chapter 5

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# Synaesthesia and Mind

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### *5.1 Outstanding Issues*

Synaesthesia, so it has been argued, is a distinct and unusual psychological phenomenon. A consideration of synaesthesia as such has led to a certain view of the mind. If the mind is at least partially constituted by cognitive modules then synaesthesia shows us that those modules should be individuated externalistically: with respect to their proper functions. The view of the underlying nature of synaesthesia as either a breakdown in modularity or an extra module might prove to be untenable. Although it seems unlikely, it might turn out that synaesthesia is caused by central cognitive processes of some kind (perhaps psychological associations between sounds and colours). The issue of the phenomenal character of experience can be related to the issue of modularity: the output of modules are representations of the properties of objects which constitute the phenomenal character of experience. A view on the latter issue depends in some ways on a view on the former issue: if modules are constituted teleologically then it would be wrong to argue that the representational properties of the additional character of synaesthetic experience can be reconstituted teleologically. If synaesthesia turns out not to involve modularity in something like the way discussed here it will still not mean that the representational properties of the additional character of synaesthetic experience can be reconstituted teleologically. There is no sound argument for qualitative properties of experience to be found in a consideration of synaesthesia. It is difficult to detach the issue of the phenomenal character of experience from an account of the individuation of the sensory modalities; synaesthesia, the characteristic mark of which is the additional phenomenal character of experience, indicates (perhaps contrary to first impressions) an argument for the identification of the phenomenal character of experience with the properties it is the function of the various senses to represent or the properties of the

senses which it is the function of other senses to represent.

Coloured hearing, the synaesthetic association between hearing and colour experiences, has been at the focus the discussion. The constitution of modularity, the composition of the phenomenal character of experience and the individuation of sensory modalities have all largely been discussed in terms of coloured hearing synaesthesia, especially those forms of coloured hearing which involve language. There is a simple reason for this: coloured hearing synaesthesia involving language processing is the most common form of synaesthesia. There are probably reasons for this too: hearing language and seeing colours are of such central significance to our lives. The majority of auditory stimuli we attend to are complex linguistic stimuli and colour processing is basic to conscious object recognition. It should be no surprise that a significant volume of the brain is devoted to language and colour processing or, at least, is related to areas of the brain, which are devoted to language and colour processing. Therefore it should be no surprise that coloured hearing synaesthesia is the commonest form of synaesthesia. But the amount of neural processing devoted to language processing and colour representation may be only part of the reason for the prevalence of coloured hearing synaesthesia. It might be that language and colour processing areas of the brain are close to each other. It might turn out that, for some reason, the developmental processes underlying synaesthesia and language acquisition favour synaesthetic links between auditory and visual areas of the brain. Or it might turn out that, for some reason, the neurological processes underlying coloured hearing synaesthesia favour links between auditory and visual areas of the brain, e.g. the auditory cortex has a high rate of neural firing and cellular metabolism. Grossenbacher points out that the strong alerting affects of auditory stimuli might also play a role in the preponderance of cases in which hearing enables colour experiences. He has also suggested that more recently evolved cognitive systems contribute more to conscious experience and since colour processing is a recent evolutionary development it is one of the main contributors to conscious experience. Colour experiences might be the type of experiences most frequently enabled by other senses

because of the salience of colour in conscious experience.<sup>1</sup>

It may be that there are different underlying physiological reasons for other forms of synaesthesia. The case of MT studied by Cytowic suggests this. But even if this is so it would not necessarily follow that the philosophical issues considered here would not then apply in a similar way to those forms of synaesthesia. Two remaining issues need to be considered. The first one is whether the preceding arguments apply to other forms of synaesthesia. What merits the arguments of earlier chapters have might be supported if they can be generalised. Section 5.2 suggests that they can. The second issue concerns how the preceding arguments, in particular concerning synaesthesia and the modularity of mind, might depend on the outcome of future synaesthesia studies. Section 5.3 considers this question.

### 5.2 Generalisations

There are potentially at least as many types of synaesthesia as there are possible pairings across the sensory modalities. Grant that there are five sensory modalities, realised by five physiological sensory systems, then there would be twenty possible pairings: each of the five sensory modalities could be associated with the other four sensory modalities in turn. There could thus be twenty possible types of synaesthesia.

Audition	⇒	Colour experience	Gustation	⇒	Smell experience
Audition	⇒	Taste experience	Gustation	⇒	Tactile experience
Audition	⇒	Smell experience	Olfaction	⇒	Colour experience
Audition	⇒	Tactile experience	Olfaction	⇒	Sound experience
Vision	⇒	Sound experience	Olfaction	⇒	Taste experience
Vision	⇒	Taste experience	Olfaction	⇒	Tactile experience
Vision	⇒	Smell experience	Touch	⇒	Colour experience
Vision	⇒	Tactile experience	Touch	⇒	Sound experience
Gustation	⇒	Colour experience	Touch	⇒	Taste experience

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<sup>1</sup> Grossenbacher 1997: 152-7.

Gustation      ⇒      Sound experience      Touch      ⇒      Smell experience

The first term in each association refers to a sensory modality. Sensory modalities may be individuated along lines outlined in the previous chapter. The second term (following the arrow) refers to a type of secondary experience where the typing is determined by phenomenal character.

Some may wish to divide the perception of touch such that one recognises a separate sense of temperature or a separate sense of pain. Synaesthesia may even support this view. It appears to support the view that the auditory processing of language is divisible. Others may wish to conflate taste and smell.

Synaesthetes usually display consistency in the types of synaesthesia they have. Typically hearing will not enable colour experiences on one occasion and taste experiences on another occasion. A synaesthete might however have more than one type of synaesthesia at different times. She might have a colour experience in response to hearing a sound and on another occasion she might have a taste experience on touching an object. It is possible although unlikely that a synaesthete might instantiate more than one type of synaesthesia at the same time. She might have colour experiences on hearing something and have tactile experiences on seeing the same thing. Synaesthetes have manifested opposite types of synaesthesia at the same time: sounds have enabled colour experiences and visual stimuli have caused sound experiences. More likely are cases in which stimulation to one perceptual modality simultaneously enables more than one secondary experience. Someone who has secondary experiences of colours in response to hearing sounds might at the same time have secondary experiences of taste. Granted that there are five sensory modalities, another list could be made to add to the above list consisting of 55 possible permutations of types of synaesthesia: each sensory modality could enable two types of secondary experiences in six different ways (30 permutations); each sensory modality could enable three types of secondary experiences in four different ways (20 permutations); and each sensory modality could enable all four types of secondary experiences (5 permutations). Some of the possible associations of one

sensory modality with more than one secondary experience were in fact evident in Luria's experiments with subject S. In response to hearing sounds sometimes S had colour experiences and taste experiences.<sup>2</sup> There is little reason to think these forms of multiple synaesthesia should constitute new types of synaesthesia rather than combinations of more basic types.<sup>3</sup> Explaining the different types of synaesthesia is arguably a more fundamental task than explaining the co-occurrence of different types of synaesthesia, although the latter issue may shed some light on the former issue: why some forms of synaesthesia occur together may help explain why some forms of synaesthesia occur at all.

Not all of the potential types of synaesthesia have actually been recorded. Of the types of synaesthesia which have been recorded some are more common than others. And there are on record few of the various possible forms of multiple synaesthesia. Of the forms of multiple synaesthesia which have been recorded some are more common than others. The most common type of synaesthesia occurs when an auditory stimulus induces a colour experience. This type of synaesthesia can be divided more finely by reference to the nature of the eliciting stimulus (e.g. music, language, types of words). But even where the secondary experience is not a colour experience the eliciting stimulus will most frequently be a sound. And even when the perceptual modality involved is not that of hearing the elicited experience will most likely be a colour experience. By contrast, there appear to be no reports of synaesthetic pairings in which the perceptual modality is gustation or olfaction and the secondary experience is a sound experience. The reason for this might be that gustatory and olfactory processing areas of the brain and the auditory processing areas of the brain are not close together. It might turn out that, for some reason, the developmental processes underlying synaesthesia do not favour links between gustatory, olfactory and the auditory processing areas of the brain. Or it might turn out that the neurological processes underlying synaesthesia do not favour links between gustatory, olfactory and the auditory processing areas of the brain. Some

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<sup>2</sup> See section 3.3.

<sup>3</sup> It would however be interesting if multiple synaesthesias were realised by brain states different from those which realised the basic types of synaesthesia.

indication of the frequencies of different types of synaesthesia can be ascertained. Out of 175 reported cases the following types of synaesthesia had the following frequencies.<sup>4</sup>

Numbers/letters enabling colour	121	69%
Time enabling colour	42	24%
Spoken sounds enabling colour	24	14%
General sound colour	23	13%
Musical sounds enabling colour	21	12%
Musical notes enabling colour	16	9%
Pain enabling colour	6	3.4%
Odours enabling colour	5	3%
Personalities enabling colour	5	3%
Tastes enabling colour	5	3%
Sounds enabling taste	3	2%
Sounds enabling touch	3	2%
Vision enabling taste	3	2%
Touch enabling taste	2	1%
Sounds enabling odour	1	0.6%
Temperature enabling colour	1	0.6%
Taste enabling touch	1	0.6%
Touch enabling smell	1	0.6%
Vision enabling touch	1	0.6%

Can the arguments of chapter three be generalised? One option is to canvass all the possibilities listed above. It will quickly become clear that there is nothing peculiar to a particular type of synaesthesia in respect of those arguments before the end of the list is reached. Consider first types of synaesthesia other than coloured hearing in which stimuli to one sensory modality produces experiences of colour.

<sup>4</sup> The catalogue, quoted in Lemley 1999, was compiled by Sean Day. These have not been tested for genuineness.

Cases of synaesthesia have been reported in which tasting something has produced colour experiences, as have cases of synaesthesia in which smelling something has produced colour experiences. Ginsberg refers to colour experiences produced by tastes and odours of cloves and rhubarb. Collins records that for one subject: sweet tastes are pink, acid tastes are green, salt tastes are blue, bitter tastes are magenta, sharp odours are magenta, lavender is pale straw yellow, peppermint is white and so on.<sup>5</sup> The series of studies conducted by Wheeler and Cutsforth in the 1920's were based on Cutsforth's own experiences. For Cutsforth, blind since childhood, touching objects produced colour experiences. More recently Lemley reports the case of Carol Steen for whom acupuncture consistently produces colour experiences. In so far as he could employ his synaesthetic experiences in the way non-synaesthetes might employ their tactile experiences Wheeler and Cutsforth claimed that the colour experiences represented an objective feature just as much as tactile experiences would have done. It can be agreed that such experiences are representational. Just because Cutsforth was able to employ his colour experiences usefully does not make them veridical representations. Most significantly however, is the fact that nowhere is there conspicuous in the above cases reports of colour experiences in which the colours were not similar, with respect to hue, saturation and brightness, to colour experiences, which were produced in visual perception. These types of synaesthesia do not lead us to doubt the conclusions of chapter three. For they do not suggest that the phenomenal character of colour experiences in more unusual types of synaesthesia cannot also be fully explained in terms, either of the properties objects are represented as having, or the properties objects present to us.

What about types of synaesthesia, which enable other types of phenomenal character? In an unusual but fully documented case in which the sound of words, nonsense words and non-linguistic sounds produced taste experiences, under test conditions, the subject was able to respond to nearly all the stimuli (which amounted to 150 words) by reference to a taste normally produced (e.g. the word 'doubt' produced a gustatory experience as she would have had were she tasting apples; the

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<sup>5</sup> Ginsberg 1923 and Collins 1929: 14.

word 'hope' produced a gustatory experience as she would have had were she tasting celery). The remaining words produced no taste. Of none of the auditory stimuli does she state that they produced a taste she had never experienced before. And, consistent with the analysis of section 4.4, Pierce names this type of synaesthesia 'gustatory audition'.<sup>6</sup>

The above cases all concern so-called 'secondary qualities'. If the class of secondary qualities form a distinctive class of qualities then there is no reason to think that the other potential types of synaesthesia, which would involve secondary sound experiences and secondary smell experiences can be accounted for in ways similar to the above.

But one might have thought that there was a distinction to be drawn between the types of synaesthesia with respect to primary and secondary qualities. It is true that when secondary experiences involve shapes there is a clear disagreement between the senses in the way that there is not when the secondary experience is as of a secondary quality. When a stimulus, for instance a taste, enables the feeling of a shape, which cannot be seen, there is arguably more apparent disagreement between the senses than there is when a stimulus, for instance a sound, enables a colour. The apparent feel of the shape clearly conflicts with any related evidence vision supplies. The apparent colour enabled by sound does not so clearly conflict with any evidence vision can supply i.e. vision cannot supply any appropriate evidence.

But primary and secondary qualities may nevertheless still be considered to be on a par with respect to synaesthesia. In the case of MW studied by Cytowic, where tastes produce tactile experiences, MW is always able to describe his experiences by reference to the properties of objects, which would be required to enable those experiences. When pressed to elaborate the sensations he felt, he once said:

'I can reach my hand out and rub it along the back side of a curve. I can't feel where the top and bottom end: so it's like a column. It's cool to the touch, as if it were made of stone or glass. What is so wonderful about it, though, is its absolute smoothness. Perfectly smooth. I can't feel any pits or indentations in the surface, so it must not be made of granite or stone. Therefore, it must be made of glass'.<sup>7</sup>

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<sup>6</sup> Pierce 1907.

<sup>7</sup> Cytowic 1996.

MW refers to properties of objects in just the way that he would were his experiences veridical. There is good reason to think that the phenomenal character of all types of synaesthetic experience can be understood in ways consistent with representationist or presentationist explanations of the phenomenal character of normal perceptual experiences. There is no more reason to think that any types of synaesthesia are constituted by qualia, in the sense of intrinsic (monadic or non-relational) properties which determine the phenomenal character of experience. Indeed the success of both ER and EP in accounting for all types of synaesthesia gives added reason to think that normal perceptual experiences are not composed of qualia.

Just as the other types of synaesthesia corroborate the conclusions of chapter three with respect to the phenomenal character of experience, so they corroborate the conclusions of chapter four with respect to the individuation of sensory modalities. The use of terminology consistent with those conclusions has already been noted in the case of gustatory audition. Cytowic terms the type of synaesthesia had by MW alternatively feeling shapes and geometric gustation. For reasons already given it is the latter terminology which best describes this type of synaesthesia. But these two types of synaesthesia also show that, since the extra phenomenal character of experience does not contribute to the individuation of the sensory modality used, there is less reason to think that it should contribute to the individuation of the sensory modality in the case of veridical experiences. There is nothing intrinsic to the secondary experiences of taste, which make them gustatory experiences, only the fact that they are indiscriminable from gustatory experiences. Nor is anything intrinsic to the secondary experiences of touch, which make them tactile experiences, only the fact that they are indiscriminable from tactile experiences. So there is less reason than we might have had to think that the phenomenal character of experience is something extra, which could be called upon to individuate a sensory modality.

It might be argued that the distinction to be drawn between the distal and the proximal senses (hearing and seeing are both distal senses whilst touch is a proximal sense) has a bearing on the individuation of sensory modalities: there is a residual difference in phenomenal character between distal and proximal senses which

contributes to the individuation of those sensory modalities. Of course hearing and seeing are enabled by different stimuli; to that extent they represent different properties of objects. Sometimes it is their function to represent the same properties. There is little reason to think that any remaining differences between hearing and seeing are essential differences. In as much as there are no other differences in phenomenal character of each distal mode of perception there is no motivation for the phenomenal character of different distal modes of perception to figure additionally in the individuation of sensory modalities. But surely touch is essentially different from distal senses even when it represents the same properties as they do. The essential difference necessarily involves a difference in the phenomenal character of the respective types of experience. But the difference between distal and proximal sensory modalities lies in the way the sensory organs function. If this difference is apparent to the perceiver then she is simply representing those difference to herself, just as does the synaesthete does who is aware that their secondary experiences are enabled via an unusual sensory modality.

### 5.3 *Prospects*

Psychologists are interested in synaesthesia because of what it can tell us about the detailed structure of the mind. In particular the more we know about synaesthesia so the more we are likely to know about the interlevels of cognitive processing and thus the constitution of different cognitive modules. Investigation of the different forms of coloured hearing synaesthesia enabled by language seems likely to shed further light on the inter-levels of language processing and thus the way that language understanding is realised by modular processes.

But as chapter two made clear interest is not restricted to empirical findings. Empirical findings are open to different interpretations. Nevertheless the metaphysical arguments of chapter two did rest on current empirical findings. Those arguments might be further supported or indeed undermined by future empirical research. Most importantly more details are required about the neurological, developmental and

genetic processes underlying coloured hearing synaesthesia. The argument concerning psychological natural kinds was ultimately premised on the view that synaesthesia has a distinct genetic component which gives rise to unusual developmental processes which in turn determine neural processing. It is because of these features that synaesthesia might be characterised as an extra module or that further conditions on modularity are required. As important is the investigation of the mechanisms underlying other forms of synaesthesia. Understanding other forms of synaesthesia, in particular understanding the neurological, developmental and genetic processes underlying them, will serve to further test the modularity hypothesis.

Merleau-Ponty pointed to three issues connected with synaesthesia: the question of how we talk of the senses, the primacy of experience and the underlying nature of mind. Each of these issues has received a response here, each response being different from the response endorsed by Merleau-Ponty's phenomenological approach. Are there other issues which synaesthesia might make us look at again? Probably, but other issues will arguably be ramifications of these three. In this sense the three issues are central philosophical issues. If this is so then synaesthesia should also be seen as of some importance for philosophy.



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## Bibliography

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- Akins, K. (1993) 'A bat without qualities' in *Consciousness*, M. Davies & G. W. Humphries (eds), Oxford: Blackwell.
- Arbib, M. A. (1989) 'Modularity and interaction of brain regions underlying visuomotor coordination', in *The Modularity of Mind*, J. Garfield (ed.), Cambridge Mass.: MIT Press.
- Argelander, A. (1927) *Das Farbenhören und der synästetische Facktor der Wahrnehmung*, Jena: Fischer.
- Aristotle. (1968) *De Anima*, trans. D. W. Hamlyn, Oxford: Clarendon Press.
- Bailey, M. E. S. & Johnson, K. J. (1997) 'Synaesthesia: is a genetic analysis feasible', in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.
- Baratoux, J. (1887) 'De l'audition colorée', *Le Progrès Médicale*, 6.
- Baron-Cohen, S. (1996) 'Is there a normal phase of synaesthesia in development?' *Psyche*, 2.
- Baron-Cohen, S. & Harrison, J. (1995) 'Synaesthesia: reconciling the subjective with the objective', *Elsevier Trend Journals*.
- Baron-Cohen, S. & Harrison, J. (eds) (1997) *Synaesthesia: Classic and Contemporary Readings*, Oxford: Blackwells.
- Baron-Cohen, S., Wyke, M. A. & Binnie, C. (1987). 'Hearing words and seeing colours: an experimental investigation of a case of synaesthesia', *Perception* 16, 761-67.
- Baron-Cohen, S., Harrison, J., Goldstein, L. & Wyke, M. A. (1993) 'Coloured speech perception: is synaesthesia what happens when modularity breaks down?' *Perception*, 22, 419-426.
- Baron-Cohen, S., Burt, L., Smith-Laittan, F., Harrison, J. & Bolton, P. (1996) 'Synaesthesia: prevalence and familiarity', *Perception*, 25, 1073-1079.
- Baudelaire, C. (1857) *Les Fleurs du Mal*, Paris: Gallimard.
- Baudelaire, C. (1860) *Les Paradis Artificiels: Oeuvres Complètes de Charles Baudelaire*, Paris: Gallimard.

- Beaunis, H. & Binet, A. (1892) 'Sur deux cas d'audition colorée', *Revue Philosophique*, 33, 448-461.
- Binet, A. (1892) 'Le problème de l'audition colorée', *Revue des deux mondes*, 113.
- Bleuler, E. & Lehmann, K. (1881) *Zwansmässige Lichtempfindungen durch Schall und verwandte Erscheinungen*, Leipzig: Fues Verlag.
- Block, N. (1980) 'Are absent qualia impossible?' *Philosophical Review*, 89, 257-74.
- Block, N. (1981) 'Psychologism and behaviourism', *Philosophical Review*, 90, 5-43.
- Block, N. (1990) 'Inverted Earth', *Philosophical Perspectives*, Vol.4. Atascadero, CA: Ridgeview.
- Block, N. (forthcoming) 'Mental Paint' in a collection of essays in honour of Tyler Burge, M. Hahn & D. Ramberg (eds), Cambridge Mass.: MIT Press.
- Block, N. & Fodor, J. (1972) 'What psychological states are not', *Philosophical Review*, 81, 159-81.
- Calkins, M.W. (1893) 'A statistical study of pseudo-chromesthesia and number forms', *American Journal of Psychology*, 5, 439-464.
- Calkins, M. W. (1895) 'Synaesthesia', *American Journal of Psychology*, 7, 90-107.
- Campbell, J. (1993) 'A simple view of colour', in *Reality, Representation and Projection*, J. Haldane & C. Wright (eds), Oxford: Oxford University Press.
- Campbell, J. (1995) 'Molyneux's question', *Philosophical Issues*, 7, 301-318.
- Carnap, R. (1967) *The Logical Structure of the World*, Berkeley: University of California Press.
- Castel, L. B. (1735) 'Nouvelles expériences d'optique & d'acoustique', *Mémoires pour l'histoire des sciences et des beaux arts*.
- Chabaliér. (1864) *Journal de Médecine de Lyons*.
- Chalmers, D. M. (1996) *The Conscious Mind*, Oxford: Oxford University Press.
- Changeux, J-P. (1985) *Neuronal Man, The Biology of Mind*, trans. L. Garey, Oxford: Oxford University Press.
- Chisholm, R. M. (1957) *Perceiving: A Philosophical Study*, Ithaca: Cornell University Press.
- Churchland, P. M. (1988) 'Perceptual plasticity and theoretical neutrality: a reply to

Jerry Fodor', *Philosophy of Science*, 55, 167-187.

Clark, A. (1993) *Sensory Qualities*, Oxford: Oxford University Press.

Clavière, J. (1898) 'L'audition colorée', *L'Année Psychologique*, 5, 161-178.

Collins, M. (1929) 'A case of synaesthesia', *Journal of General Psychology*, 2, 12-25.

Cornaz, A. (1848) *Des abnormalities des yeux et ses annexes*, Lausanne.

Cornaz, A. (1851) *Annales d'Oculistiques*, 1.

Cosmides, L. & Toobey, J. (1994) 'Origins of domain specificity: the evolution of functional organization', in *Mapping the Mind*, L. Hirshfield & S. Gelman (eds), Cambridge: Cambridge University Press.

Costa, L. da F. (1996) 'Synaesthesia - a real phenomenon? or real phenomena?' *Psyche*, 2.

Cummins, R. (1975) 'Functional analysis', *Journal of Philosophy*, 72, 741-765.

Cytowic, R. E. (1989) *Synaesthesia: A Union of the Senses*, New York: Springer Verlag.

Cytowic, R. E. (1993) *The Man who Tasted Shapes*, New York: Putnam.

Cytowic, R. E. (1995) 'Synesthesia: phenomenology and neuropsychology - a review of current knowledge', *Psyche*, 2.

Cytowic, R. E. & Wood, F. B. (1982a) 'Synesthesia I: a review of major theories and their brain basis', *Brain and Cognition*, 1, 23-35.

Cytowic, R. E. & Wood, F. B. (1982b) 'Synesthesia II: psychophysical relationships in the synesthesia of geometrically shaped taste and colored hearing', *Brain and Cognition*, 1, 36-49.

Dann, K. (1998) *Bright Colors Falsely Seen: Synaesthesia and the Search for Transcendental Knowledge*, New Haven: Yale University Press.

Day, S. (1996) 'Synaesthesia and synaesthetic metaphors', *Psyche*, 2.

De Rochas. (1885) 'L'audition colorée', *La Nature*.

Downey, J. E. (1912) 'Seeing sounds and hearing colors', *Independent*, 78, 315-318.

Dretske, F. (1995) *Naturalising the Mind*, Cambridge, Mass.: MIT Press.

Ducasse, C. J., (1942) 'Moore's refutation of idealism', in *The Philosophy of G. E.*

- Moore, P. A. Schlipp (ed.), Chicago: Northwestern University Press.
- Ellis, A. W. & Young, A. W. (1988) *Human Cognitive Neuropsychology*, Hove: Erlbaum.
- Fechner, G. T. (1876) *Vorschule der Ästhetik*, Leipzig: Breitkopf & Hartel.
- Flournoy, T. (1892) 'L'audition colorée', *Archives des Sciences Physiques et Naturelles*, 28.
- Flournoy, T. (1893) *Des Phénomènes de Synopsie*, Paris: Alcan.
- Fodor, J. (1974) 'Special sciences, or the disunity of science as a working hypothesis', *Synthese*, 28, 97-115, reprinted (1981) in *Representations*, London: Harvester Press.
- Fodor, J. (1983) *The Modularity of Mind*, Cambridge, Mass.: MIT Press.
- Garfield, J. (ed.) (1989) *The Modularity of Mind*, Cambridge Mass.: MIT Press.
- Gall, F. J. (1822-25) *Sur les Fonctions du Cerveau et sur Celles de Chacune de ses Parties*, Paris: Baillière.
- Galton, F. (1883) *Inquiries into Human Faculties and their Development*, London: MacMillan.
- Gibson, J. J. (1950) *The Perception of the Visual World*, Houghton Mifflin: Boston.
- Gibson, J., J. (1966) *Senses Considered as Conceptual Systems*, Houghton Mifflin: Boston.
- Ginsberg, L. (1923) 'A case of synaesthesia', *American Journal of Philosophy*, 582-589.
- Girardeau, C. (1885) 'De l'audition colorée', *L'Encéphale*, 5.
- Goethe, J.W, von. (1970) *Theory of Colours*, trans. C. L. Eastlake, Cambridge Mass.: MIT Press.
- Goodale, M. A. (1995) 'The cortical organization of visual perception and visuomotor control', in *Visual Cognition*, S. M. Kosslyn & D. N. Osheron (eds.), Cambridge MA: MIT Press.
- Goodman, N. (1951) *The Structure of Appearance*, Harvard University Press.
- Gray, J.A., (1997) 'Possible implications of synaesthesia for the hard question of consciousness', in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.
- Grice, H. P. (1962) 'Some remarks about the senses', in *Analytical Philosophy*, R. J.

Butler (ed.), Oxford: Blackwell.

Grossenbacher, P. G. (1997) 'Perception and sensory information in synaesthetic experience', in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.

Halligan, P., Hunt, M., Marshall, J. & Wade, D. T. (forthcoming) 'When seeing is feeling: acquired synaesthesia or phantom touch', *Neurocase*.

Hamlyn, D. W. (1961) *Sensation and Perception*, London: Routledge.

Hamlyn, D. W. (1994) 'Perception, sensation and non-conceptual content', *Philosophical Quarterly*, 44, 139-153.

Harrison, J. & Baron-Cohen, S. (1996) 'Acquired and inherited forms of cross-modal correspondence', *Neurocase*, 2.

Harman, G. (1988) 'Wide Functionalism' in *Cognition and Representation*, S. Shiffer & S. Steele (eds), Boulder Colo.: Westview Press.

Harman, G. (1990) 'The intrinsic quality of experience', *Philosophical Perspectives* Vol.4. Atascadero, CA: Ridgeview, reprinted (1999) in *Reasoning, Meaning and Mind*, Oxford: Oxford University Press.

Harman, G. (1996) 'Explaining objective color in terms of subjective reactions', *Philosophical Issues*, 7.

Hoffman, L. (1786) *Versuch einer Geschichte der Malerischen Harmonie überhaupt*, Halle.

Holden, (1885) *Nature*, 6, 252.

Jackson, F. (1977) *Perception*, Cambridge: Cambridge University Press.

Jackson, F. (1982) 'Epiphenomenal qualia', in *Philosophical Quarterly*, 32, 127-36.

Jacobs, L., Karpik, A., Bozian, D. & Gothgen, S. (1981) 'Auditory-visual synaesthesia: sound induced photisms', *Archives of Neurology*, 38.

Johnston, M. (1992) 'How to speak of the colors', *Philosophical Studies*, 68, 221-263, republished (1997) in *Readings on Color, Volume One*, A. Byrne & D. R. Hilbert (eds), Cambridge Mass.: MIT Press.

Kaiser, H. (1871) 'Association der Wörter mit Farben', *Archiv für Augenheilkunde*, 96.

Karmiloff-Smith, A. (1992) *Beyond Modularity: a Developmental Perspective on Cognitive Science*, Cambridge, Mass.: MIT Press.

Karwoski, T. F., Odbert, H. S. & Osgood, C. E. (1942) 'Studies in synesthetic thinking. the role of form in visual responses to music', *Journal of General Psychology*, 26, 199-222.

Kennedy, H., Bullier, J. & Dehay, C. (1989) 'Transient projection from the superior temporal sulcus to area 17 in the newborn macaque monkey', *Proceedings of the National Academy of Science of the USA*, 86, 8093-8097.

Kennedy, H., Bâtardière, A., Dehay, C. & Barone, P. (1997) 'Synaesthesia: implications for developmental neurobiology', in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.

Kim, J. (1982) 'Psychophysical Supervenience', *Philosophical Studies*, 41, 51-70.

Kim, J. (1992) 'Multiple-realizability and the metaphysics of reduction', *Philosophy and Phenomenological Research*, 52, 309-35, republished (1993) in *Supervenience and Mind*, Cambridge: Cambridge University Press.

Kirk, R. (1973) 'Sensations and behaviour', *Mind*, 82, 43-60.

Kirk, R. (1994) *Raw Feeling*, Oxford: Oxford University Press.

Korb, K. (1996) 'Synaesthesia and method', *Psyche*, 2.

Kliewer, G. (1998) 'Neutral colour concepts', *Philosophical Studies*, 91, 21-41.

Kripke, S. A. (1980) *Naming and Necessity*, Oxford: Basil Blackwell.

Krohn, W. D. (1892) 'Pseudo-chromaesthesia, or the association of words with words, letters and sounds', *American Journal of Psychology*, 5.

Lauret. (1886) *Annale des Maladies*.

Lauret. (1886) *Revue Generale d'Ophthalmologie*.

Lauret & Duchaussoy (1887) 'Un cas héréditaire de l'audition colorée', *Revue Philosophique*, 23, 222.

Lemley, B. (1999) 'Do you see what they see?', *Discover*, 20.

Levine, J. (1983) 'Materialism and qualia: the explanatory gap', *Pacific Philosophical Quarterly*, 64, 354-61.

- Levine, J. (1988) 'Absent and inverted qualia revisited', *Mind and Language*, 3: 217-87.

Levine, J. (1993) 'On leaving out what it's like', in *Consciousness*, M. Davies & G. W. Humphries (eds), Oxford: Blackwell.

- Lewkowicz, D. J. & Turkewicz, G. (1980) 'Cross-modal equivalence in early infancy: auditory-visual intensity matching', *Developmental Psychology*, 16, 597-607.
- Loar, B. (1990) 'Phenomenal properties', *Philosophical Perspectives*, Vol. 4. Atascadero, CA: Ridgeview.
- Luria, A. R. (1968) *The Mind of a Mnemonist*, New York: Basic Books.
- Lycan, W. G. (1973) 'Inverted spectrum', *Ratio*, 15, 315-9.
- Lycan, W. G. (1987) *Consciousness*, Cambridge, Mass.: MIT Press.
- Mciver Lopes, D. M. (2000) 'What is it like to see with your ears? The Representational Theory of Mind', *Philosophy and Phenomenological Research*, 60, 439-453.
- Mahling, F. (1926) 'Das Problem der audition colorée', *Archiv für Gesamte Psychologie*, 57.
- Marcé, L. V (1860) *Des Altérations de la Sensibilité*, Agrégation Thesis. Paris.
- Marks, L. E. (1975) 'On colored-hearing synesthesia: Cross-modal translations of sensory dimensions', *Psychological Bulletin*, 82, reprinted (1997) in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.
- Marks, L. E. (1982a) 'Synaesthetic perception and poetic metaphor', *Journal of Experimental Psychology: Human Perception and Performance*, 8, 15-23
- Marks, L. E. (1982b) 'Bright sneezes and dark coughs, loud sunlight and soft moonlight', *Journal of Experimental Psychology: Human Perception and Performance*, 8, 177-193.
- Marks, L. E. (1987) 'On cross-modal similarity: on auditory-visual interactions in speeded discrimination', *Journal of Experimental Psychology*, 13, 384-94.
- Marks, L. E. & Stephens, J. C. (1966) 'Individual brightness functions', *Perception and Psychophysics*, 1, 17-24.
- Marlsen-Wilson, W. D. & Tyler, L.K. (1989) 'Against modularity', in *The Modularity of Mind*, Garfield, J. (ed.), Cambridge Mass.: MIT Press.
- Marr, D. (1976) 'Early processing of visual information', *Philosophical Transactions of the Royal Society*.
- Marr, D. (1982) *Vision*, San Francisco: Freeman.
- Marshall, J.C. (1984) 'Multiple perspectives on modularity', *Cognition*, 17, 209-242.

- Martin, M. (1993) 'Sight and touch' in *The Contents of Experience: Essays on Perception*, T. Crane (ed.), Cambridge: Cambridge University Press.
- Martin, M. (1997) 'The reality of appearances', in *Thought and Ontology*, M. Sainsbury (ed.), Milan: FrancoAngeli.
- Martin, M. (typescript) 'Phenomenal transparency'.
- Mattingley, J. B. & Rich, A. (2000) 'Conscious and unconscious information processing in colour-graphemic synaesthesia: objective evidence from interference and priming tasks', *Consciousness 2000 Conference*, University of Tucson.
- Maurer, D. (1993) 'Neonatal synaesthesia: implications for the processing of speech and faces', in *Developmental Neurocognition: Speech and face processing in the First Year of Life*, B. de Boysson-Bardies, S. E. Schonen, P. Juszyk, P. McNeilage & J. Morton (eds.), Dordrecht: Kluwer, reprinted in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.
- Mayerhausen, G. (1882) 'Über Association der Klänge, speciell der Wörter mit Farben', *Klinische Monatsblätter für Augenheilkunde*.
- McDowell, J. (1982) 'Criteria, defeasibility and knowledge', *Proceedings of the British Academy*.
- McGilvary, J. (1994) 'Constant colors in the head', *Synthese*, 100, 197-239.
- McGinn, C. (1978) 'Mental states, natural kinds and psychophysical laws', *Proceedings of the Aristotelian Society*, 78, 195-221, reprinted (1991) in *The Problem of Consciousness*, Oxford: Oxford University Press.
- Meltzoff, A. N. & Borton, R. W. (1979) 'Intermodal matching by human neonates', *Nature*, 282, 403-4.
- Millikan, R.G. (1984) *Language, Thought and other Biological Functions*, Cambridge, MA: MIT Press.
- Mills, S. & Beatty, J. (1979) 'The propensity theory of fitness', *Philosophy of Science*, 46.
- Motluk, A. (1994) 'The sweet smell of purple', *New Scientist*, 143.
- Motluk, A. (1995) 'Current work and theory of synaesthesia', *New Scientist*, 144.
- Mudge, E. L. (1920) 'The common synaesthesia of music', *Journal of Applied Psychology*, 3, 342-5
- Myers, C. A. (1911) 'A case of synaesthesia', *British Journal of Psychology*, 4, 228-

238.

Nagel, T. (1974) 'What it is like to be a bat', *Philosophical Review*, 63, 435-50.

Nüel, J. (1876) 'Retina', *Dictionnaire encyclopedique des sciences medicales*, vol.83.

Nüssbaumer, J. A. (1873) 'Über subjectiv Farbenempfindungen', Vienna: *Medischen Wochenschrift*.

O'Brien, G. & Opie, J. (1998) 'The disunity of consciousness', *Australasian Journal of Philosophy*, 76, 378-395.

Ogden, C. K. & Richards, I. A. (1985) *The Meaning of Meaning*, London: Routledge & Kegan Paul.

Ortmann, O. (1933) 'Theories of synaesthesia in the light of a case of colour hearing', *Human Biology*, 51, 155-211.

Paulesu, E., Harrison, J., Baron-Cohen, S., Watson, J., Goldstein, L., Heather, J. Frackowisk, R. & Frith, C. (1995) 'The physiology of coloured hearing', *Brain*, 118, 661-676.

Peacocke, C. (1983) *Sense and Content: Thought and their Relations*, Oxford: Oxford University Press.

Peacocke, C. (1984) 'Colour concepts and colour experience', *Synthese*, 58, 365-82.

Pedrono. (1882) 'L'audition colorée', *Annale d'Oculistiques*, 88.

Perroud. (1863) *Mémoires de la Société des Sciences Médicales de Lyon*.

Philippe, J. (1893) 'Résumé d'une observation d'audition colorée', *Revue Philosophique*, 36:330-334.

Pierce, A. H. (1907) 'Gustatory audition: a hitherto undescribed variety of synaesthesia', *American Journal of Psychology*, 18, 341-352.

Price, H. H. (1932) *Perception*, Methuen, London.

Putnam, H. (1965) 'Brains and behaviour' in *Analytical Philosophy*, R. Butler (ed.), Oxford: Blackwell.

Putnam, H. (1967) 'Psychological predicates', in *Art, Mind and Religion*, W. H. Capitan & D. D. Merrill (eds.), Pittsburgh: University of Pittsburgh.

Putnam, H. (1975) 'The meaning of meaning', in *Language, Mind and Knowledge*, K. Gunderson (ed.), Minneapolis: University of Minnesota Pres.

Putnam, H. (1984) 'Models and modules', *Cognition*, 17, 253-264.

- Putnam, H. (1994) 'Hilary Putnam' in *A Companion to the Philosophy of Mind*, S. Guttenplan (ed.), Oxford: Blackwell.
- Rey, G. (1991) 'Sensations in a language of thought', *Philosophical Issues*, 1.
- Rimbaud, A. (1873) *Alchimie du verbe, une saison en enfer*, Paris.
- Robinson, H. (1993) *Perception*, London: Routledge.
- Rosenthal, D. (1991) 'The independence of consciousness and sensory quality' in Villaneuva, E. (ed.), *Philosophical Issues*, 1.
- Sachs, G. T. L. (1812), *Dissertatio inauguralis historiae naturalis duorum leucæthiopum ipsius et sororis ejus*, Erlangen.
- Samuels, R. (1998) 'Evolutionary psychology and the massive modularity hypothesis', *British Journal for the Philosophy of Science*, 49, 575-602.
- Schirillo, J. A. (1995) 'A synesthesia experiment: consciousness of neural activity', *Psyche*, 2.
- Searle, J. (1983) *Intentionality: An Essay in the Philosophy of Mind*, Cambridge: Cambridge University Press.
- Segal, G. (1997) 'Synaesthesia: implications for the modularity of mind', in *Synaesthesia: Classic and Contemporary Readings*, S. Baron-Cohen & J. Harrison (eds), Oxford: Blackwells.
- Segalen, V. (1981) *Les Synesthésies et l'École Symboliste*, Paris: Éditions Fata Morgana.
- Sellars, W. (1975) 'The adverbial theory of the objects of sensation', *Metaphilosophy*, 6.
- Shallice, T. (1987) *From Neuropsychology to Mental Structure*, Cambridge: Cambridge University Press.
- Shapiro, L. & Epstein, W. (1998) 'Evolutionary theory meets cognitive psychology: a more selective perspective', *Mind and Language*, 13, 171-194.
- Shoemaker, S. (1975) 'Functionalism and qualia', *Philosophical Studies*, 27, 291-315.
- Shoemaker, S. (1981) 'Are absent qualia possible: a reply to Block', *Philosophical Review*, 90, 4, 581-99.
- Shoemaker, S. (1982) 'The inverted spectrum', *Journal of Philosophy*, 74, 357-381.

- Shoemaker, S. (1990) 'Qualities and qualia: what's in the mind', *Philosophy and Phenomenological Research*, 50, 109-31, reprinted (1996) in *The First-Person Perspective and Other Essays*, Cambridge: Cambridge University Press.
- Shoemaker, S. (1991) 'Consciousness and qualia', *Mind*, 100, 507-24, reprinted (1996) in *The First-Person Perspective and Other Essays*, Cambridge: Cambridge University Press.
- Shoemaker, S. (1994) 'Phenomenal character', *Noûs*, 28, 21-38, reprinted (1996) in *The First-Person Perspective and Other Essays*, Cambridge: Cambridge University Press.
- Simon, H. A. (1969) *The Sciences of the Artificial*, Cambridge Mass.: MIT Press.
- Snowdon, P. F. (1981) Perception, vision and causation, *Proceedings of the Aristotelian Society*, 81, 175-92.
- Sober, E. (1985) 'Panglossian functionalism and the philosophy of mind', *Synthese*, 64, 165-193.
- Steinbrügge. (1897) *Über secundäre Sinnesempfindungen*, Wiesbade.
- Stephens. (1882) 'Colors of letter', *Popular Scientific Monthly*, 3.
- Stephens, J. C. & Marks, L. E. (1965) 'Cross modality matching of brightness and loudness', *Proceedings of the National Academy of Sciences*, 54, 407-11.
- Stillings, N. (1989) 'Modularity and naturalism in theory of vision', in *The Modularity of Mind*, Garfield, J. (ed.), Cambridge Mass.: MIT Press.
- Sturgeon, S. (1997) 'The epistemic view of subjectivity', *Journal of Philosophy*, 94, 221-35.
- Suarez de Mendosa, F. (1890) *L'audition colorée*, Paris: Octave Dion.
- Tooby, J. & Cosmides, L. (1995) 'Forward' in *Mindblindness: An Essay on Autism and Theory of Mind*, S. Baron-Cohen, Cambridge, MA: MIT Press.
- Tye, M. (1984) 'The adverbial approach to visual experience', *Philosophical Review*, 195-225.
- Tye, M. (1995) *Ten Problems of Consciousness: A Representational Theory of the Phenomenal Mind*, Cambridge Mass.: MIT Press.
- Tye, M. (1999) 'Phenomenal consciousness: the explanatory gap', *Mind*, 108, 705-725.
- Van Camp, C. (1996) 'Synaesthesia and artistic experimentation', *Psyche*, 3.

Vauthier, (1860) *Gazette des Hopitaux*.

Verga, (1865) *Archiv italiani malattie nervose*, Milan.

Vernon, P. E. (1930) 'Synaesthesia in music', *Psyche*, 10.

Wager, A. (1999) 'The extra qualia problem: synaesthesia and representation', *Philosophical Psychology*, 12, 263-281.

Walsh, D. M. & Ariew, A. (1996) 'A taxonomy of functions', *Canadian Journal of Philosophy*, 26, 493-514.

Wartman. (1849) *Deuxième Mémoire sur le Daltonisme*, Geneva.

Weiskrantz, L. (1986) *Blindsight: A Case Study and Implications*, Oxford: Oxford University Press.

Wheeler, R. H. (1920) 'Visual phenomena in the dreams of a blind subject', *Psychological Review*, 27, 315-322.

Wheeler, R. H. & Cutsforth, T. D. (1921a) 'The role of synaesthesia in learning', *Journal of Experimental Psychology*, 4, 448-468.

Wheeler, R. H. & Cutsforth, T. D. (1921b) 'The number forms of a blind subject', *American Journal of Psychology*, 32, 21-25.

Wheeler, R. H. & Cutsforth, T. D. (1922a) 'Synaesthesia and meaning', *American Journal of Psychology*, 33, 361-384.

Wheeler, R. H. & Cutsforth, T. D. (1922b) 'Synaesthesia: a form of perception', *Psychological Review*, 29, 212-220.

Wheeler, R. H. & Cutsforth, T. D. (1924) 'Synaesthesia in the process of reasoning', *American Journal of Psychology*, 35, 88-97.

Wheeler, R. H. & Cutsforth, T. D. (1925) 'Synaesthesia in the development of the concept', *Journal of Experimental Psychology*, 8, 149-159.

Williamson, T. (1990) *Identity and Discrimination*, Oxford: Blackwells.

Williamson, T. (1995) 'Is knowing a state of mind?', *Mind*, 104, 533-565.

Wittgenstein, L. (1958) *Philosophical Investigations*, trans. G. E. M. Anscombe, Oxford: Basil Blackwell.

Zellner, D.A & Kautz, M.A. (1990) 'Color affects perceived odor intensity', *Journal of Experimental Psychology*, 16.