TWO CASES OF SYNAESTHESIA.

By CHARLES S. MYERS.

I.

During his recent visit to England, the well-known Russian composer, Alexander Scriabin, kindly allowed me to carry out an examination of his coloured hearing. Unfortunately the time at his disposal and the necessity of communicating in a language (French) foreign to both of us[1] made a very thorough investigation impossible. But the results obtained form perhaps a sufficiently interesting contribution to the psychology of music to merit publication in their present form.

Colours form for Scriabin so important a part of the total effect of sounds that he desires his *Prometheus* to be performed to the accompaniment of concealed lamps which shall flood the concert-hall with a light of ever-changing colour; the music of his *Mystery*, when completed, will be presented with a similar play of colours, and with odours.

Scriabin's attention was first seriously drawn to his coloured hearing owing to an experience at a concert in Paris, where, sitting next to his fellow-countryman and composer Rimsky Korsakov, he remarked that the piece to which they were listening (in D major) seemed to him yellow; whereupon his neighbour replied that to him, too, the colour seemed golden. Scriabin has since compared with his compatriot and with other musicians the colour effects of other keys, especially B, C major and F♯ major, and believes a general agreement to exist in this respect. He admits, however, that whereas to him the key of F♯ major appears violet, to Rimsky Korsakov it appears green: but this deviation he attributes to an accidental association with the colour of leaves and grass arising from the frequent use of this key for

[1] The latter difficulty was much reduced by the subsequent cooperation of M. Alexander Briantshaninov, to whom I gladly take this opportunity of expressing my obligation.

pastoral music. He also allows that there is some disagreement as to the colour-effect of the key of G major. Nevertheless, as is so universally the case with the subjects of synaesthesia, he believes that the particular colours which he obtains must be shared by all who are endowed with coloured hearing. Doubtless, on more systematic inquiry, the same disagreements which, as is well known, occur in the case of coloured vowel sounds, coloured names, coloured days of the week, and (as I have pointed out[1]) with coloured pitch and coloured timbre, will be discovered in the case of coloured tonality[2].

As will have been gathered by now, Scriabin's chromaesthesia refers to the *tonality* of the music. As the tonality changes in a piece, so the colour changes. Scriabin explains that "the colour *underlines* the tonality; it makes the tonality more evident." The colour or a change of colour sometimes appears to him before he is aware of the tonality or of a change of tonality. For such reasons he believes that the musical effects are enhanced by the simultaneous presentation to the eye of the appropriate colour.

In general, when listening to music, he has only a 'feeling' of colour; only in cases where the feeling is very intense does it pass over to give an 'image' of colour.

The older music, with its infrequent changes of tonality, gives him a colour changing in intensity instead of in quality; "it has not the psychological basis of modern music." Certain compositions, and most of Beethoven's Symphonies, are not of a kind to need colour; they are "too intellectual in character."

In the case of coloured hearing which I have previously published[3], the colour is dependent on the *pitch* of the note; in many other cases, already described, it is dependent on the *name* of the note. But for Scriabin a single note has in itself no colour; it has the colour of its tonality. Indeed, he insists that whether in or apart from musical compositions, a single tone cannot occur alone; even outside music it is accompanied by overtones, which, in many cases, especially in the case of the sounds of nature, include inharmonic overtones, in addition to the harmonic series. Thus it is, that if we imitate the sound of a bell by adding an appropriate series of weaker tones to a louder fundamental tone on the pianoforte, we may find on analysis

[1] "A Case of Synaesthesia," This *Journal*, 1911, iv. 228–238.

[2] Cf. Th. Flournoy, *Des phénomènes de synopsie*, Paris et Genève, 1893, 101; also Henri Laures, *Les Synesthésies*, Paris, 1908, 30.

[3] *Loc. cit.*

a combination of two or more tonalities, and consequently an inter-play or fusion of the corresponding colours. So, too, any simultaneous combination of tones produces on Scriabin a simple or composite colour effect according as it suggests one or several tonalities.

The strongest colours for Scriabin appear to be those relating to the keys of C major, D major, B major and F♯ major, placed respectively in the red, orange, yellow, blue and violet. Starting, however, from C at the red end of the spectrum, Scriabin finds that

Red	Orange	Yellow	Green	Blue	Violet
C G	D	A	E	B	F♯

as he passes from hue to hue, the successive colours correspond to tonalities rising by a series of fifths. Thus the key of C is red, of G red to orange-red, of D orange to yellow, of A yellow to green, of E green to blue, of B blue to violet, and of F♯ violet. The colours of the remaining keys D♭, A♭, E♭, B♭ and F are believed by Scriabin to be extra-spectral,—either ultra-violet or infra-red. Thus the key of F is "on the verge of red," giving often the effect of a metallic lustre.

Into Scriabin's objections to the terms major and minor in tonality it is impossible to enter here. The harmonies, in his *Prometheus*, are based upon a scale of six notes, which represent the seventh, eighth, ninth, tenth, twelfth and thirteenth overtones of a fundamental, yielding the tones (in the scale of C) *c d e f♯ a b♭* approximately. A series of such tones, *e.g.* c^1 $f'^{\sharp}$ $b'^{\flat}$ e^2 a^2 d^3, simultaneously played in true (untempered) intonation, produces what he terms a "single sound," one that is not easily analysable. Scriabin believes that there is always a psychical struggle between a tone and its overtones, just as a rivalry may be conceived between the various tones emitted at any moment by an orchestra,—a contest for the pitch of the single fundamental sound which the listener shall hear.

In my previous paper on synaesthesia I concluded that "for the *full* development of synaesthesia, a strong tendency to a certain kind of association is requisite—a tendency to form associations between corresponding members of two homologous series[1]." With the subject then under investigation, any letter (*e.g.* Y) immediately tended to call up a number (25) expressing its position in the alphabet. Such a tendency may readily yield the above diagram, where consecutive scales are associated with consecutive spectral colours, and may also result in

[1] *Loc. cit.* 238.

the strong inclination towards mysticism which is characteristic of Scriabin. For him the (red) key of C relates to matter, and is redolent with the odour of the soil, whereas the (violet) key of F♯ is spiritual and ethereal. He believes that colours have their over-colours, as tones have their overtones.

II.

The other case of synaesthesia here recorded is in a lady (Subject *B*) who is an accomplished painter and takes a keen enjoyment in hearing music although she does not play on any instrument.

Like the case (Subject *A*) described in my previous paper, this subject has very poor visual imagery, and the colours which she obtains vary with the pitch and with the timbre of the tone.

A visual image only comes to her when she has taken special care to attend to the previous perception of the object. Thus, when painting, she can visualise her 'sitter' if she has attended particularly to the pose. But she cannot get a visual image of her breakfast table, "because she has never attended to it." Nor does she 'see' colours in sounds; she explains her coloured hearing on the ground that sounds "give her the same mental sensations" as colours.

The flow of colours she experiences in listening to music afford her "enormous pleasure." They vary with the composer; the works of Chopin, for example, yield "very translucent colours such as green leaves in the spring," whereas those of Schumann "never give 'primary' colours, they give purples and the like,—not transparent colours." The colours come more reliably when they are not specially looked for: "it is so difficult to be truthful when one is watching."

Individual tones have each a colour dependent on their pitch; but the colours, as given in the following table, show a sequence very different from that described in the case of *A* in my previous paper.

Pitch of tone	Colour
256	Prussian blue, clear blue.
300	A clear mixed colour, a suggestion of streakiness, dark blue streaked with violet.
400	Clear dark violet—clear purple.
500	Deeper than red, very deep golden, transparent.
600	No definite colour, opaque, streaky, perhaps black and flame colour.
700	No definite colour, uninteresting, perhaps light green.
800	Blue.
900	Rather like 800.
1200	Might be yellow, something of that nature, very translucent.
2048	Getting yellow.

The above colours were obtained for the tones of tuning forks, sounded in irregular order. Several of the tones were repeated at the same and at a later sitting, and gave confirmatory results[1].

For higher tones, the whistles supplied with the Edelmann tone series were employed. When the whistle giving tones from about 1704 down to 1024 vibrations per second (a^3 to c^3) was sounded, *B* replied that the highest notes were a faint green, or yellow-green, while the lower became "more blue, less yellow." The tones of the next whistle, ascending from about 1704 to about 3408 vibrations per second (a^3 to c^4) were described as becoming "more and more emerald-green." The Galton whistle tone of 6000 vibrations per second (about g^5) appeared green, ascending from which still higher tones became increasingly colourless.

That is to say, in this subject we appear to have (i) a change in hue from blue through purple and reddish-yellow to green, for tones varying from about 200 (256) to 700, and (ii) a broadly similar repetition of this flow of colours—from blue through yellow to green—for tones ascending from 800 towards the upper audible limit. The blue of 200 became more and more purple as the lower limit was approached, *e.g.* "much darker and more purple than the gentian" (128), "still more purple" (64), etc.

It was remarked by the subject that the colours almost invariably appear to her as uniform or streaky (streaked with 'black' or 'light'), clear or opaque, smooth or rough. Yet there was "no form in the colours"; hence she could not explain, for example, in what direction the streaks were running.

As in the case of Subject *A*, described in my previous paper, traces of the colours obtained by two single tones were often also obtainable for two simultaneously sounding tones. Thus the simultaneous tones, 300, 600, were described as "something very dark,—either blue or black,—and something clear and light"; for the simultaneous tones 300, 500, she reported—"that has that horrid Prussian blue in it,—a colour I loathe."

The simultaneous tones, 600, 900, were described as "an acid mixed sound. To me there are three colours in it. For the moment I can't name them. One is black. They all seem very clear colours. (You can have a clear black as in looking into a pond at night.) There is a streakiness in the colours—a black and two things bright and crude."

[1] The only exception was a failure at the second sitting to obtain gold or flame colours for the region 500—600. It appeared to behave like the region 700—800. Thus 500 suggested a streaky green, 512 an intense green, 600 a streaky black and clear light blue.

Like *A*, *B* is more 'alive' to the colour components than to the tonal components of sounds. She "may be aware of the presence of several colours where the number of simultaneous tones is not attended to."

Again as with *A*, the effect of increasing the richness of a tone by adding to its overtones results in a 'rise' of the colour of the tone.

Source of sound	$c^1=256$	$c^2=512$
Tuning fork (with resonator)	Clear blue	Rose colour in blue
Tonmesser	Reddish blue	Bright yellow
Tone variator	Indigo blue	Greenish
Horn	A horrid red colour	
Clarinet	A mixture of yellow and green	