**Essay**

Alexandra Thannhäuser

# “Purple Numbers and Cheese is Sharp”

## Is our use of colour in metaphors embodied in our experience?

MSc Design and Digital Media
Media and Culture
University of Edinburgh

0345287

# Purple Numbers and Cheese is Sharp

***Is our use of colours in metaphors embodied in our experience?***

*Alexandra Thannhäuser*

## Introduction

The use of metaphors dates back to antiquity where they were used to embroider and decorate the language of poetry and play.
Aristotle (384-322 B.C.), the Greek philosopher, educator and scientist was one of the earliest to mention metaphors and gives us a first theory on the functionality of metaphors in his work *The Poetics*. According to him :

> "Metaphor is the application to one thing of the name belonging to another. We may apply (a) the name of a genus to one of its species or (b) the name of one species to its genus, or (c) the name of one species to another of the same genus, or (d) the transfer may be based on a proportion."

Aristotle's theory brings along various problems. Due to his strong emphasize on the type hierarchy in the production and interpretation of metaphors, his explanation for the metaphor derivation (origin) often appears to be forced for his aim and convenience. He expects to be able to decode/decipher every metaphor by using an omnipotent stencil, the type hierarchy.
This theory however should be viewed at and taken into consideration for the time it was stated. "Metaphor is not seen in his framework to be an essential feature of human communication, rather it is described in *The Poetics* as a formula for achieving more colourful expressions." [1]
Since then there have been many approaches to understanding and defining the term *metaphor* which has led to a variety of different views. In general one can group two basic understandings of metaphors, the *literalists*, saying that all language is literal opposed to the *interactionists* stating that all language is metaphorical.

## Lakoff and Johnson

The foremost supporters of the interactionists view are Mark Johnson and George Lakoff. According to them our "conceptual system is metaphorically structured and grounded within our bodily experience." [2]
Most people tend to think that metaphors appear merely in association with poetry because we use our language in such a tacit and natural that we do not realize the ubiquity of metaphors in our daily life and language, let alone the origin of the expression.

In Chapter 4 of Lakoff and Johnson's book entitled *Metaphors We Live By*, they describe *Orientational Metaphors*, introducing spatial orientations such as up-down, in-out, front-back and others.

[1] Aristotle, http://www.compapp.dcu.ie/~tonyv/trinity/aristotle.html
[2] Lakoff and Johnson, *Metaphors We Live By*, 1980, Afterword 2003, p.115

The up-down spatial orientation metaphor declares the term *up* as being something good or positive and *down* resembling /standing for something negative.
According to them this is attributable to our bodily constitution, our bodily experiences and "that they function the way they do in our physical environment."[3]
Therefore we consider `health and life´ as *up* and `sickness and death´ as *down*.
To demonstrate our daily use of these terms they give examples such as *he's at the peak of health* in contrary to *he came down with the flu*.

After each example, Lakoff and Johnson give a brief explanation on how these expressions can be traced back to our physical bodily experience. The following was stated after the examples, given above, concerning health/sickness.:" *Physical basis: Serious illness forces us to lie down physically. When you are dead you are physically down."*.[4]

But there are also various terms where it is difficult to retrieve the spatialization in metaphors because they are so naturally built into our language already, like *high society* and *high status*. But also our definition and understanding of *heaven being up* and *hell being situated below* us can be categorized as an orientational metaphor.

Metaphors play an extensive role "in the way we function, the way we conceptualize our experience and the way we speak."[5]

Following the idea of metaphors being grounded in our bodily experience, is this theory applicable to our perception of colours and the use of colours in/as metaphors?

## Theories of Colour

In order to answer this question, I felt the need to take a look at the origin of colours, where they actually exist or start existing : *Are leaves really green, does our brain create the colour green or do leaves have something to them that isn't green but is translated into green by our perceptual system?*[6]

There have been many theories on colour. Probably the two most important characters are Isaac Newton (1672-1727) and Johann Wolfgang von Goethe ( 1749-1832). Due to their very different backgrounds, Newton being a scientist and Goethe a scholar of arts their approaches to the theory of colour differ a lot.

While Goethe's theory emphasizes the *subjective* perception of colour, and concentrates on the perceiving and emotional person, most of Newton's examinations are more objective and rely on scientific research (except for his division of his colour circle; following music it is divided into seven segments, because an octave has seven intervals).

[3] Lakoff and Johnson, *Metaphors We Live By*, 1980, Afterword 2003, p.115
[4] ibid, p.14
[5] ibid, p.115
[6] Katja Borchert, Quote, University of Washington, 2003

Goethe's theory suggests that all colours are created through light. To be more precise, "all colours are created out of the *cloudiness* under the influence of light. The sum of all colours is grey." [7]

Through various experiments Newton established proof of the colourless sunlight inhabiting all colours. "In his theory the sum of all *lightcolours* is the white light." [8]
Although the two approaches are very different they do not exclude each other. They even replenish and complete each other, "since neither theory can fully explain the colours." [9]

To explain Goethe's whole theory would lead too far, but there is one topic which I find very worth mentioning. In his discussion about physiological colours he describes an experiment where we are to look at a very bright light in a fairly dark room for a few seconds. Then we are to look at a white or black wall.
What we will see is a sequence of different colours:

| | |
|---|---|
| 0-13 seconds | green spot with black centre |
| 13 seconds | green spot |
| 13-42 seconds | green spot with green centre |
| 42 seconds | yellow spot |
| 42-90 seconds | green spot with yellow centre |
| 90 seconds | green spot |

(Data take from Tania Süllentrup, 2003)

This sensation Goethe is talking about is nowadays known as *Complementary* and *Simultaneous Contrast*. "It explains how one overbearing (geforderte) colour generates a complementary overbearing colour in the eye."[10] ( red-cyan, blue-orange etc.)

Why did I feel this needed to be mentioned?
In speaking of colours we categorize them using words such as *warm* and *cold*. Where does our perception concerning these expressions come from? Can there be a coherence made between the way one colour generates or demands another and one colour generating a certain emotion? This would mean two different sensual systems are somehow intertwined and work coherently.

Goethe further talks about sensorial-moral effect of colours in his examination and discussion on colours. According to him the perception of a certain colour has an effect on our feelings and soul.
The colours yellow, yellow-red and red-yellow for example are supposed to be emotionally elevating, vivacious and lively; whereas the colour blue gives us a feeling of cold and aloofness.

Returning to Lakoff and Johnson's theory of metaphors being grounded in our bodily experiences, is our use of colours in metaphors, such as *feeling blue* or *to be caught*

[7] Tania Süllentrup, *Die Wirkung von Farbe auf den Menschen*, 2003, p
[8] ibid, p.15
[9] ibid
[10] ibid, p.12

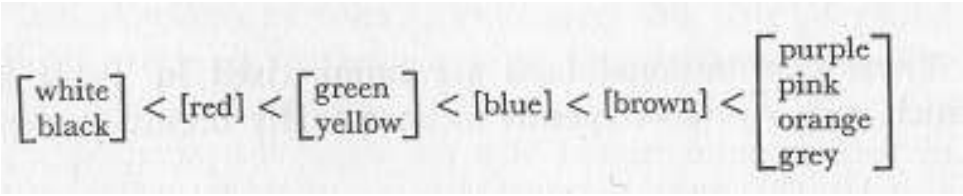
*red handed*, an expression of emotions connected to colours and therefore really grounded in our bodily experience?
*Yellow* for example might bring up an association with the sun and therefore being a warm and pleasant colour to us. Does a human living in the desert have the same feeling towards the colour yellow as being a lively and vivacious colour? Or would this person describe yellow as being a colour of exertion and effort?

If every colour would ask for the same emotions in humans all over the world, there would be a universal colour/emotion code and our use of colours in metaphors would not merely be grounded in our bodily experience but in our bodies.

## Basic Colour Terms

Maybe there once existed a universal coherence between colour and emotions but it has receded due to evolution and civilisation. Is there a universal evolution of basic colour terms?

Following up this thought I came across a book *Basic Colour Terms, Their Universality and Evolution* by Brent Berlin and Paul Kay.
"The research reported here strongly indicates that semantic universals do exist in the domain of colour vocabulary. Moreover these universals appear to be related to historical development of all languages in a way that can properly be termed evolutionary."[11]
The data they collected comes from 20 different languages. They found out that " a total universal inventory of exactly eleven basic categories exists from which the eleven or fewer basic colour terms of any given language are always drawn. The eleven basic colour categories are white, black, red, green, yellow, blue, brown, purple, pink, orange and grey."[12]
Further and absolutely unexpected they found that "if a language encodes fewer than eleven basic colour categories, then there are strict limitations on which categories it may encode. (...) The distributional restrictions of colour terms across languages can be summarized by (or generated from) a rather simple rule:




(Data taken from Berlin and Kay, *Basic Colour Terms*)

Meaning that "the expression *a<b* signifies that *a* is present in every language in which *b* is present and also in some languages in which *b* is not present.

[11] Berlin, Kay, *Basic Color Terms, Their Universality and Evolution*, 1969, p.1
[12] ibid, pp.2

*The Bright Light and the Prince Of Darkness*

After reading Goethe's theory of colour which is based on light and darkness, I found it very interesting that according to Berlin and Kay, the first two terms for colours are white and black.

Our use of white and black in metaphors is strongly dominated by emotions deriving from these colours. A recent article in a German newspaper titled "Das helle Licht und der Prinz der Dunkelheit" (The bright light and the prince of darkness) a new study verifies how *black* and *white* influence our power of imagination. Light always seems to be associated with something positive and dark is experienced as negative. US-Psychologists assume that "these associations of abstract emotions with concrete/specific characteristics could be a fundamental human thought process."[13]

More than a hundred test persons took part in their experiment. Each person was confronted with words that either have a positive or negative meaning to them on a screen. The words that appeared on the screen were randomly shown in black or white writing.
The test persons were to rapidly categorize the words as *positive* or *negative.* The result was that the categorization was done much more easily when the meaning of the word and the colour harmonized. The categorization where meaning and colour did not harmonize appeared to be more difficult.
The researchers say that this is attributed to the way we learn. In our process of development we begin with sensual experiences which are later on used to create abstract patterns of thought. An example given is that of a baby who experiences *warm* as something good and pleasant and only later on can see the coherence to an expression such as *a warm smile*.

In Eva Heller's book entitled *How colours influence our emotion and reason*, the chapters are divided by colours. In the chapter about the colour black she gives an example of how colours can effect and manipulate our sensual system.
"An American independent trader , whose employees were moaning about the too heavy boxes they had to carry, had the dark boxes painted white. The result was that the grumble had an end and the employees actually experienced the boxes as being lighter."

Of course stories like these should carefully be examined and questioned before taken into consideration because "every effect is the sum of experiences."[14]

If I were to confront the class with a black foam rubber football and a white foam rubber football and would ask them which one carries more weight, they would logically suggest that their weight was equal. Or if I were to show them a black foam rubber ball and a white marble ball, which one would they propose to be heavier?

"The impression of weight does not merely depend on their colour"[15], but if we lack experience it might manipulate our sensual system.

[13] Newspaper, Germany, 2003, *Das Helle Licht Und Der Prinz Der Dunkelheit*
[14] Eva Heller, *Wie Farben auf Gefühl und Verstand wirken*, 2000, p.152
[15] ibid

Synaesthetic Metaphors

There must be some kind of connection between our different sensual systems. Apparently one sense activates or is used to judge or explain another. Taking the example above, our sense of sight (black boxes) sends a message to our sense of touch telling us that this is a heavy object.

The combination of different senses used coherently can vary, like :

| | |
|---|---|
| "a sour smell" | (smell/ taste) |
| "a sharp crack" | (hearing/ touch) |
| "humid green" | (vision/ touch) |

(Data: first synaesthetic metaphors found in *Gravity's Rainbow* by Thomas Pynchon,1973)

There has been a study on Synaesthetic Metaphors by Sean Day. "In a Synaesthetic Metaphor" , he describes, " a certain perceptual mode is initially specified (or may be assumed) but the imagery is linguistically related in terms belonging to one or more differing perceptual modes."

In his research he studied various English novels and extracted all metaphors, which showed two different senses used coherently and listed these *synaesthetic metaphors* according to their frequency of appearance.
"The time range includes books from Chaucer's *Canterbury Tales*, written in 1387; Shakespeare; 19th century novelists such as Melville; and current popular novels such as those by Michael Crichton."

He came to the result that "in English literature, synaesthetic metaphors employed for descriptions of tactile sounds predominate. Of the various senses, hearing is most frequently expanded and elaborated upon both *synaesthetic sensory perception* and synaesthetic metaphors. Synaesthetic "visual hearing" which antedates language, may have influenced language development."[16]

He then compared his result with the same process of extraction from a German novel entitled *The Buddenbrocks* by Thomas Mann and found out that the results differ.

For my research it would have been more interesting to examine the novels according to the time in which they were written and then compare whether our frequency of certain synaesthetic metaphors has changed during time due to some senses being more important than others.
Comparing various English written works to one German novel might not be a universal result, but may raise the assumption that our combined use of different senses in metaphors may vary from language to language, culture to culture and person to person.

This again would underline Lakoff and Johnson's theory stating that our use of metaphors is grounded in our experience.

[16] Sean Day, *Synaesthesia and Synaesthetic Metaphors*, 1996

Yellow is sharp

Another example found on incoherent senses used coherently was in Eva Heller's book *How colours influence our emotion and reason*. Chapter ten which deals with the colour *yellow* of her book carries the title *Yellow is sharp*.
"Colour is always inherent to a shape. Is there an optimal shape for each colour?".

This theme was discussed frequently at the Bauhaus, where artists such as Wassily Kandinsky, Paul Klee and Johannes Itten were teaching. This question never came up as long as artists were drawing and painting their surroundings in their innate and physical state. It was only when the abstraction of the natural constitution of the objects became subject that debates arose.

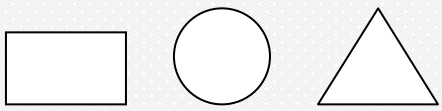
"In the symbolism of the middle ages the primary shape *circle* was associated with the colour *blue* because the sky is blue and people thought of it as being a round dome/copula. The colour *red* was brought into coherence with the *rectangle* because it was an unnatural shape that could only be formed by human work. The third primary shape a *triangle* is traditionally attached to the colour *yellow*. Often god was symbolically represented as an eye in a yellow triangle."[17]

The Bauhaus was not interested in following religious symbolism but were after a theory which merely would derive from the coherence of colours and shapes. There was unanimity concerning yellow being sharp, but they could not agree about which colour, red or blue belonged to which shape, rectangle or circle. To find out they gave their students the three shapes and the three colours and asked them to assign one colour to each shape. Unfortunately the result was never published but one says that it resembled the old symbolism. The other difficulty with this test was that the students were familiar with the old symbolism and therefore were or might have been influenced by their experience.

I thought it might be interesting to see whether *yellow was really sharp* and asked the ddm class to answer the following piece of paper:

Thanks for taking a short moment and answering this

Given three shapes and three colours



blue yellow red

Which shape would you assign to which colour?

(Data: A.Thannhäuser, 26 test persons, ddm class 2003/04)

[17] Eva Heller, *Wie Farben auf Gefühl und Verstand wirken*, 2000, p.96

The outcome of the questionnaire is the following:

| Shape | red | blue | yellow |
|---|---|---|---|
|  | 5 | **18** | 3 |
|  | **11** | 6 | 9 |
|  | 10 | 2 | **14** |

(Numbers represent the people giving that answer out of 26)

Unfortunately there was only a small amount of people participating in the questionnaire (26 test person) which probably affects the result. A number above 100 test persons would be more reliable, more convincing and more useful to find some kind of pattern.
What really does surprise me is that a rectangle appears to be more clearly defined as *blue* than the triangle is associated with *yellow*.

I asked the ddm class to please place their nationality on the form as well. But, sadly, due to the small number of persons I can not make a statement about cultural differences in colour association with shapes (if this is possible at all is questionable).

Synaesthesia ("co- sensation", in Greek origin)

While studying the involuntary connection of senses (thanks Mathew T. for mentioning this phenomenon to me) which is described as *Synaesthesia* I came across an article in the Journal of Consciousness Studies (No 12, 2001) called *Synaesthesia- A Window Into Perception, Thought and Language* by V.S. Ramachandran and E.M. Hubbard.

According to their definition Synaesthesia is "an involuntary joining in which real information of one sense is accompanied by a perception in another sense."[18]

But where does this phenomenon derive from? "Is it a sensory effect or simply a memory association? Are they (simply) being *metaphorical* (just the same way we say cheese tastes sharp?"

Ramachandran and Hubbard demonstrate an experiment, which has been tested various times. Test persons are given two shapes :

[18] Ramachandran, Hubbard, Journal of Consciousness Studies, 8, No. 12, 2001, pp.3-34

(Data taken from article above)

and are to assign the words *kiki* and *bouba* to them.

“Because of the sharp inflection of the visual shape, subjects tend to map the name *kiki* onto the figure on the left, while the rounded contours of the figure on the right make it more like the rounded auditory inflection of *bouba*.”[19]

There are various different kinds of sensory combinations which all are summed up together under the term Synaesthesia. In Synaesthesia “ sights can have sounds, sounds can have tastes and, more commonly, black-and-white numbers and letters can appear colored.

“What is the colour of five? What does it feel like to taste [colour] mint ? What is the sound of blue?”[20]

These questions might not make sense to us.
Up until today there are no explanations for this phenomenon although it is suggested that we all carry some kind of synaesthetic features within us, which are merely suppressed by other parts of our brain. But how should we otherwise explain our synaesthetic experiences under the influence of drugs, such as LSD ?
“People don’t just grow neural connections in half an hour,”[21]

“Synaesthesia raises all sorts of big questions about how we create an internal representation of the world”.[22] Just recently the neurologist V. Ramachandran came up with a test for Synaesthesia “which seemed to suggest it was the sight of the number that was important.”[23]
But then shortly after psychologist at Waterloo University came up with the evidence stating that their “research suggests that colour experiences coincide with the processing of meaning. It is the concept of a number that’s coloured.” The following was their test:

“Smilek and his colleagues gave a synesthete some simple mental arithmetic to do while looking at different coloured sheets. They found that when the colour of the sheet clashed with the colour of the answer, her response was slower than when it was the same. An actual colour could interfere with the colour of a number that existed only in her head.”

Returning to the article *The bright light and the prince of darkness*, similar results have been made on people who are not synesthetes where people had a white

[19] Ramachandran, Hubbard, Journal of Consciousness Studies, 8, No. 12, 2001, pp.3-34
[20] Jerome Burne, Financial Times, January 6, 2001
[21] Peter Grossenbacher, Head of the Consciousness Laboratory at Naropa University in Boulder, Colo.
[22] Jerome Burne, Financial Times, January 6, 2001
[23] ibid

colour in mind for a word with a positive meaning and vice versa a black writing in mind for a word with a negative meaning.

## Synaesthesia and Music

*Syn-es-the-sia* n. Physiol. Sensation produced at a point other than or remote from the point of stimulation, as of a colour from hearing a certain sound

Of the thirty possible forms of Synaesthesia, the most common is the sensory link between sounds and colour.

The coherence between Synaesthesia and music has a long history. It goes back to the time around 550 B.C. , "where mathematical equations were offered for the musical scales, showing that musical notes could be seen in relation between numbers."[24]

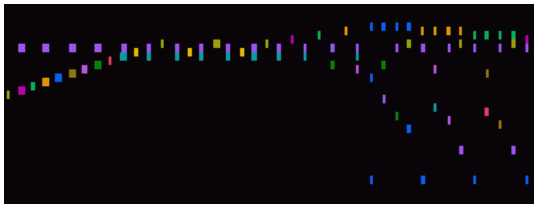
Around 350 B.C. it was Aristotle who wrote "that the harmony of colours were like the harmony of sounds. Soon artists were trying to define a colour/sound equivalent and in 1650 Marie Cureau de la Chambre proposed a scheme of coloured musical intervals.

The composer Olivier Messiaen, who has synaesthetic colour sound experiences, once explained in an interview :"When I hear music, I see inwardly, in the mind's eye, colours which move with the music. This is not imagination, nor is it a psychic phenomenon. It is an inward reality."[25]

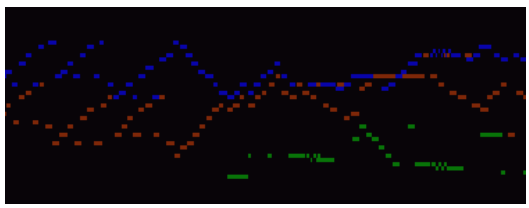
But how is a sound visually presented through colour?

Messiaen produced art based on notes he took of melodies and rhymes of birdsongs, which were called *2nd* and *3rd mode*. *3rd mode* for example "corresponds to an orange with tints of red and black, touches of gold and a milky white with iridescent reflections like opals."[26]

A different way of visualizing music I found on the web which has different compositions represented in colour :[27]



Johannes Brahms *Capriccio, opus 76 no. 2*
Shown with Harmonic Colouring



Johann Sebastian Bach
*Organ Sonata IV, e minor, third movement*
Colours identify right hand, left hand, pedals

[24] Thereminvox, *A Brief History of Synaesthesia and Music*, www.thereminvox.com/story/28/?page=2
[25] Erica Goode, *When People See a Sound and Hear a Colour*
[26] Lexical Synesthesia…an example, www.largenumber.co.uk/album.htm
[27] The Music Animation Machine, www.well.com/user/smalin/mam.html

## Conclusion

What caught my attention is that the majority of synesthetes are artists, musicians and painters. People I consider having a strong emotional consciousness with a great will to express their inner world, feelings and thought- all abstract terms- visually through e.g. colours. It seems that within this group there still exists a closer coherence of the primary senses (touch, hearing, sight, smell and taste), whereas in the majority of the population this phenomenon of involuntary connections might have suffered regression and/or could be suppressed by our cultural development (because they might not be of any use anymore?).

In Lakoff and Johnson's newly edited book *Metaphors we live by*, they added a new afterword in which they describe recent fundamental insights in the metaphor theory by Christopher Johnson, Joseph Grady and Srinivas Narayanan.
"Using computational techniques for neural modelling, Narayanan developed a theory in which conceptual metaphors are computed neurally via neural maps – neural circuitry linking the sensory-motor system with higher cortical areas. (…) For example the metaphor *Affection is Warmth* arises from the common experience of a child being held affectionately by a parent; here, affection occurs together with warmth. In Johnson's terms they are conflated. There is neuronal activation occurring simultaneously in two separate parts of the brain: those devoted to emotions and those devoted to temperature. As the saying goes in neuroscience, "Neurons that fire together wire together.".

Looking at Brent and Kay's research on *Basic Colour Terms*, I believe that our perception of colour and use of colours in language have a primary universal origin to them. Colours are associated with different emotions; otherwise expressions such as *feeling blue* would not make any sense to us.
However they are not necessarily universally existent now. There is a similar expression to *feeling blue* in German: "ich bin blau" translated "I am blue". This expression does not have any melancholy or sadness connected to it. It means *I am drunk*. The use of the word blue is attributed to the history of how blue dye was produced.

Colours are innately used in our language because they bring along a specific mood or emotion. How far this is to be traced back in history or our evolutionary process I am not sure. But I do believe that to an extent our sensual systems are connected in a way that certain involuntary coherences (instincts ?) are grounded in our body, and our use of colours in metaphors or language in general is nourished, extended, enhanced and completed by our evolutional, cultural and personal bodily experience.

We are culturally, evolutionarily and personally shaped in our use of metaphors with some neurological underpinning.

"You don't have a choice whether to think metaphorically. Because metaphorical maps are part of our brains, we think and speak metaphorically whether we want to or not. (…) Further since our brains are embodied, our metaphors will reflect our commonplace experiences in the world."

*Lakoff and Johnson*

**References:**

Coyne, Richard. 1995. MIT Press
*Designing Information Technology in the Postmodern Age: From Method to Metaphor*

Johnson, Mark. 1987. Chicago, Illinois: University of Chicago Press
*The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*

Lakoff, George and Mark Johnson. 1980. Chicago, Illinois: University of Chicago Press, Afterword 2003
*Metaphors We Live By*

Berlin and Kay. 1969. University of California Press Berkeley and Los Angeles
*Basic Colour Terms*

Suellentrup, Tanja. 2003. Ev. Fachhochschule Rheinland- Westfalen- Lippe
*Die Wirkung von Farben auf den Menschen – unter Berücksichtigung der Farbenlehren Newtons und Goethes und der Psychologie der Wahrnehmung*

Heller, Eva. 2000. Droemer Verlag, München
*Wie Farben auf Gefühl und Verstand wirken*

Ramachandran, Hubbard, Journal of Consciousness Studies, 8, No. 12, 2001, pp.3-34
*Synaesthesia – A Window Into Perception, Thought and Language*

Jerome Burne, Financial Times, January 6, 2001

**Internet**

Sean Day, Synaesthesia and Synaesthetic Metaphors, 1996,
http://psyche.cs.monash.edu.au/v2/psyche-2-32-day.html

Thereminvox, A Brief History of Synaesthesia and Music,
www.thereminvox.com/story/28/?page=2

Erica Goode, *When People See a Sound and Hear a Colour*

Lexical Synesthesia…an example,
www.largenumber.co.uk/album.htm

The Music Animation Machine,
www.well.com/user/smalin/mam.html

www.steinerschule-bern.ch/goeth/farbenlehre/farbe_6_sinnlichsittlich.htm#Gelb

www.bbc.co.uk/radio4/reith2003/reith2003_lecture4_transcript.shtml