

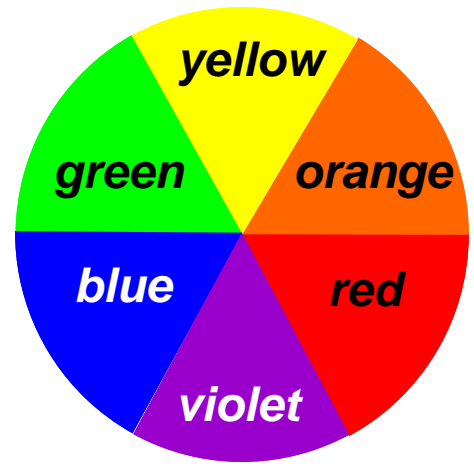
‘The Truth about Colour was known 100 years ago...’

An attempt to dispel the confusion and misinformation about Colour

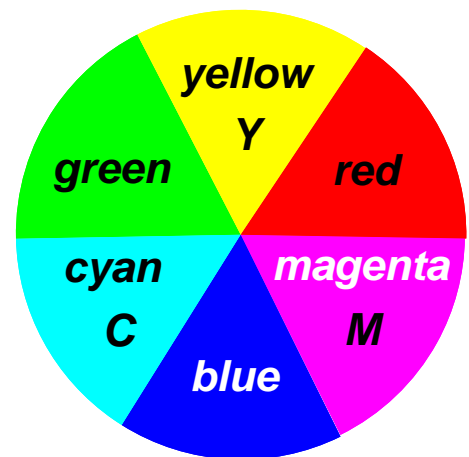
by Peter Turner

We are blessed with the ability to see in colour and the appreciation of our world is much enhanced because of it.

In our education most of us were given a basic understanding of colour, however much of what we were told was and in many cases still is, based on errors made by the ‘experts’ 300+ years ago.



INCORRECT

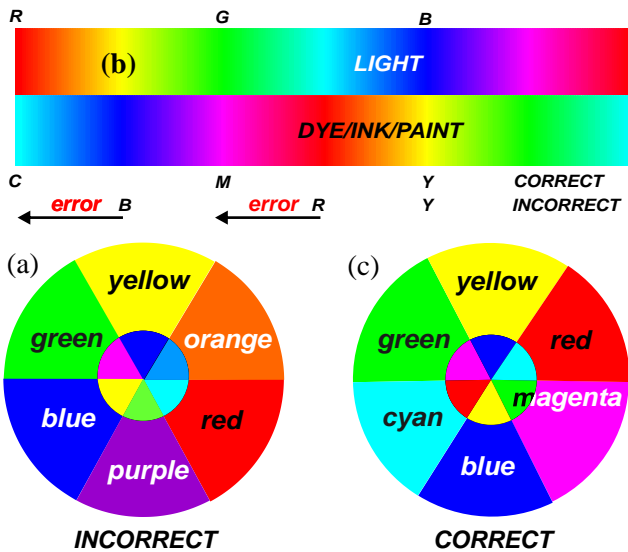


CORRECT



*‘Green Boat at Lagos’ 7” x 9”
Watercolour 1999 by Peter Turner
using Winsor & Newton Artists’
Watercolours - Winsor Yellow,
Permanent Rose (Magenta) and Winsor
Blue Green Shade (Cyan) on Arches*

The wrong information—Believed to be fact for several hundred years, widely accepted by the art community and published in many current text books: *'The Primary Colours for paint/dyes and inks are Red Yellow and Blue. The secondary colours are Orange, Green and Purple. Complementary colours can be found opposite each other on the colour wheel.'* (a).



The traditional Artist's colour wheel (a). In this version the centre has been inverted to show the complements, none of which are correct – colours opposite each other on the wheel should be complements

The light spectrum – from infrared, to ultraviolet, represents our ability to see colour. We cannot perceive the lower end of infrared or the upper end of ultraviolet. Because of this, a complete spectrum would have each end disappearing into black. This is of some use in explaining colour but its value can be significantly increased by removing the black, placing it on a linear scale (b) and arranging it in a circle (c) so that complementary colours are opposite each other.

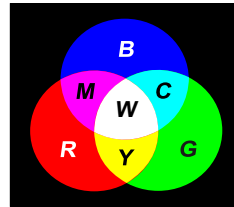
Primaries Definition—for additive (subtractive) mixing:

1. The three colours capable of making the most other colours
2. A primary cannot be mixed from any two other colours
3. The three added will equal white (black).

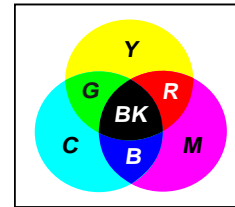
Scientists were aware of the properties of filtered light several hundred years before they understood the properties of dye, ink and paint. Newton proved that white light, e.g. sunlight, contained all of the visible colours and each of the many colours could be arrived at by mixing just three 'primary' filtered lights: Red, green and blue (as in the Television). Since all three added equalled white, this was called additive mixing.

What happens when white light strikes a coloured object (including dye, ink or paint) is very different. All of the colours are absorbed by the object except for its native colour which is reflected.

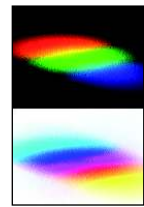
For paint mixing to hold true with light mixing, the



Light – Additive
RGB Primaries



Paint – Subtractive
CMY Primaries



RGB from a prism photo and CMY (RGB Inverted)

The Primaries for Light (RGB) and Paint (CMY) are the complements of each other

three primaries need to be inverted (an inverted colour is a complementary colour). Because when these three were added the result was black, this was called subtractive mixing.

In the 1670s Newton believed that the subtractive three were: Cyan (a greenish blue), Magenta (a bluish red) and Yellow; but at that early stage, he was unable to prove it.

Sadly, for artists, the then experts decided that the three were yellow, red (as in blood), and blue (as in royal blue); only yellow was correct. Because of this the legion of artists who have tried to work with just these three have never been satisfied with the result: Insufficient range of colour - only dull greens and muddy browns instead of black.



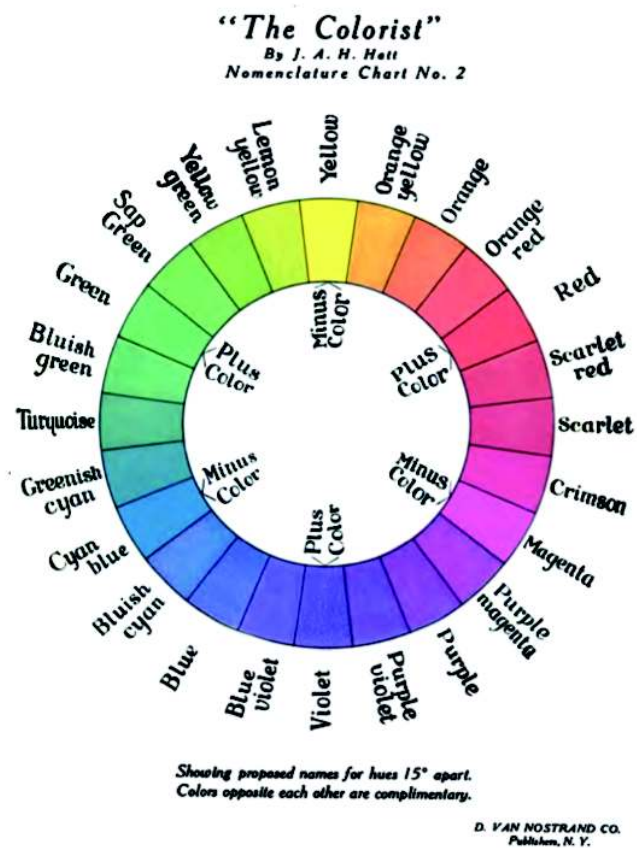
Gainsborough's 'Blue Boy' was painted with just three pigments – he was not happy... Courtesy of the Huntington Library, Art Collections, and Botanical Gardens, San Marino, California

To put the record straight: There is only one set of correct primary colours, for subtractive RGB and one for additive CMY mixing see 1. above. Secondary colours, if we retain the concept, are red green and blue.

Note: According to the definition, red and blue cannot be primaries because red can be made from yellow and magenta and blue from cyan and magenta.

Despite this the traditional Artist's Colour Wheel became a valuable tool to teach colour mixing and to help understand the nature of colour. It is easy to see that if yellow and red are added together the result is orange and yellow and blue is green, etc.

Between 1870 and 1910 the RGB/CMY penny at last dropped, with several scientists including J A H Hatt (who patented important ideas in colour photography).



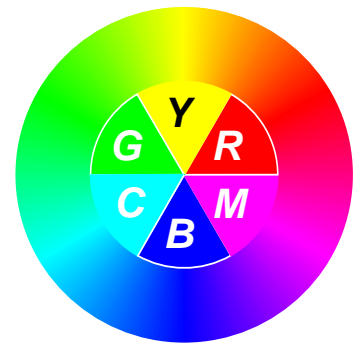
Hatt's Color Wheel of 1908 was spot on with only minor changes needed to the colour names.

Since 1900 part of the Education, Paint Making and Art Communities have slowly moved from denial to grudging acceptance – an alarmingly small part and much belated, considering how quickly it was recognised in photography, printing and design.

As soon as artists understand that they have the same range of colour available as in every colour magazine, using the same CMY pigments, most of them never look back.

The wheel on the next page has 36 steps and

shows what happens when any colour is mixed with its complement (in equal amounts at the centre, the result will be black). In reality there are no steps just a vast near infinitely variable set of colours and tones.



In practice not all converts use only three paints, arriving at black can be a time consuming process. Some will prefer to buy black, or better for watercolour, Neutral Tint. Also although CMY can create all of the colours that the eye is capable of seeing, the process of mixing reduces the saturation (the amount of colour relative to grey) in the resulting mix. Really bright royal blue, green and red are affected.

This is a theoretical rather than practical limitation; no one suggests that the colour in a magazine is 'dull' and it is a common mistake for beginners in painting to use too much colour, especially in landscapes.

Printer makers have expended vast sums trying to resolve this non issue by adding more inks but we note that PC Pro Magazine's top A Listed Photo Printer for most of 2008 used just CMYK.

Note: Printers use black (K) in addition to CMY because they print a lot of text and black pigment costs much less than black made from C, M and Y.

There may be rare occasions when fully saturated versions of reds greens and blues are needed. When this is evident, it is recommended that they should be acquired and used on a case by case basis and not used in every day mixing.

Why has it taken 100 years for only some artists and educators to accept real from false colour basics? We could speculate – things we were told at school and accepted as facts are not easily reversed, paint makers do not see it as their job to educate us, at least not on this subject and last but probably most significant, how can all those artists and educators, i.e. us, admit that we could have got it so wrong for so long?

Peter Turner, a tutor in Watercolour and Oil for over 40 years (see www.peterturner.org), is the Author of 'Oil and Watercolour Demystified' ISBN 9780955758607 – upon which this article is based.



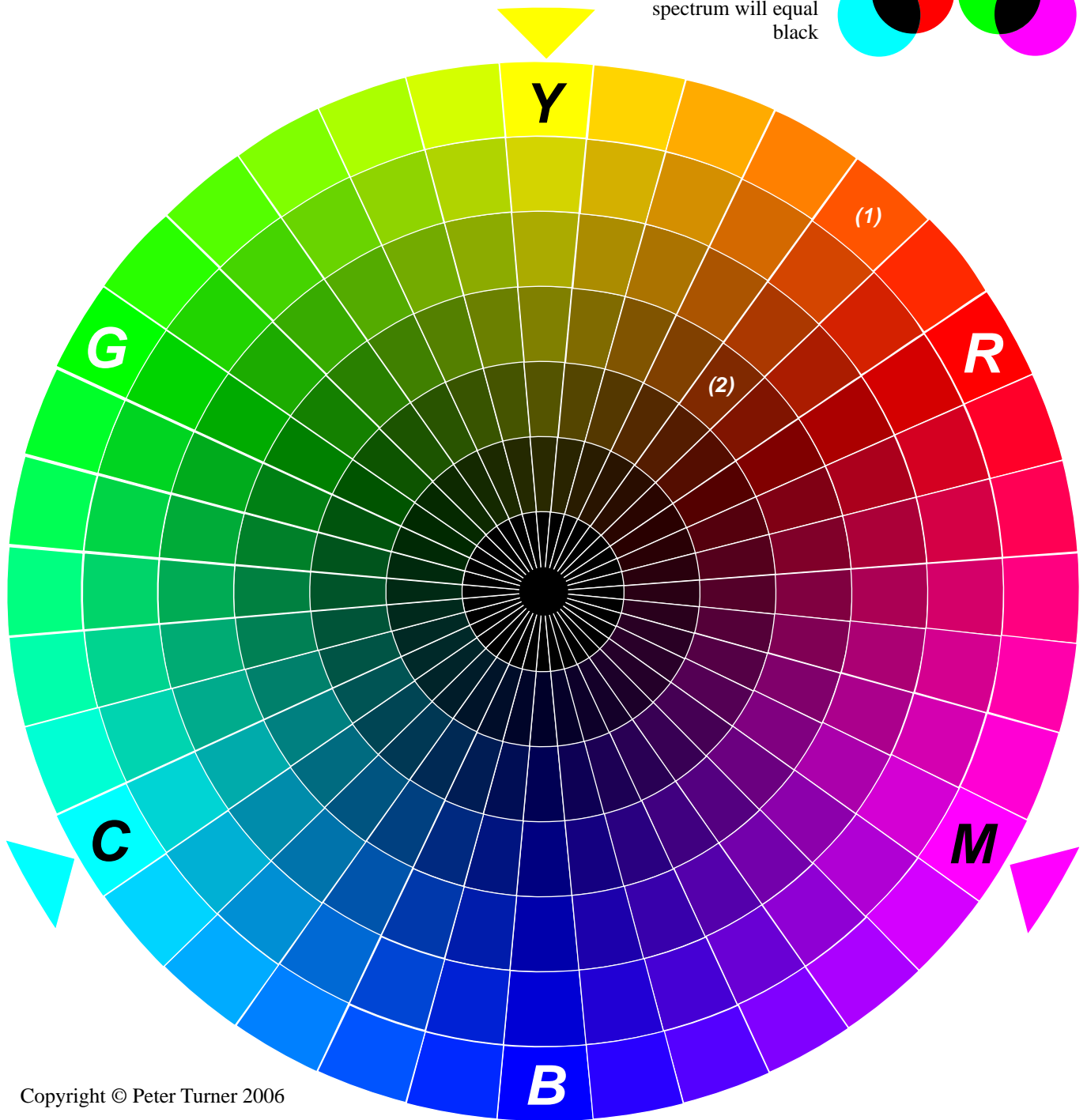
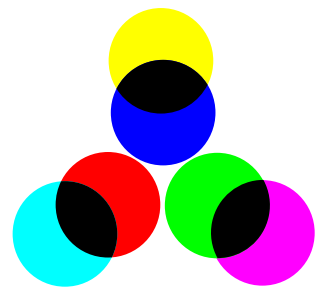
St Emilion with normal and fully saturated colours

LEARNING AID FOR CMY MIXING

Using the Colour Wheel

Example: To arrive at Burnt Sienna (2). Start with Yellow and add small amounts of Magenta until you get to (1). Now add small amounts of Black until you get to (2)

Adding any two complementary colours from anywhere in the spectrum will equal black



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THE CORRECT PIGMENTS are:

Primary Blue (Cyan) PB15:3, Primary Red (Magenta) PV19, Primary Yellow PY97.

Maimeri (Italy) is one of only a handful of makers offering artists' watercolour and oil paints labelled 'primaries' and one of only two offering paints that actually work: e.g. *Maimeri Blu: superior watercolours, Primary Blue - *Cyan* 400, Primary Red - *Magenta* 256, Primary *Yellow* 116, see Maimeri Blu Watercolours:

<http://www.maimeri.it/CGIDEV2P/SIT030.PGM?VARIA=ENAO001&V4=Watercolours&VX=>

These are excellent single pigment paints. Their Puro range of Oils should be as good but to be yet tested and not available in Europe.

The only other oil set (not exact primaries and not marked as such but which work in practice) are the *W&N Artists' Oil and Watercolour: *Cyan* Winsor Blue-green shade, *Magenta* Permanent Rose and Winsor *Yellow*.

To identify the good from the bad try to find the pigment numbers. e.g. PB15.3. All Artists quality paints will have the pigment numbers on the tube. Avoid any with more than one pigment.

*The 'good' paints here are available from <http://www.jacksonsart.co.uk>

'Natalie' 11" x 7" Watercolour 2008
by Peter Turner
An example using Maimeri
Primaries on Arches 300lb not paper



2008

Natalie

Peter Turner