Yellow + Blue … approximately Green

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*Remarkably the basic design of the slide rule has lent itself to many unlikely trades and professions – usually through innovative scales but for one all the scales are just swatches of **colour**!*

Abstract

In 1998 legendary Dutch "champion" slide rule collector IJzebrand Schuitema (1929-2013) wrote the first of a 3-part article with the memorable title: *"2 x 3 … approximately 6"*. Each instalment recounted the Dutch contributions to the design and manufacture of slide rules in the 20th century. In 2003, with fellow-collector Herman van Herwijnen (1929-2004), he published an extended international version as a book. This article is both a tribute to IJzebrand and a parody on the unforgettable catchphrase title of his original trilogy.

A Rose by any other name[1] ….

Purists say that to qualify as a slide rule a calculating aid must have at least one logarithmic scale. This maybe a helpful rule-of-thumb for limiting what goes into a slide rule collection. But despite not having a single logarithmic scale it is, when judged by the respected "duck test[2]", an aid for choosing colours that is linear, has a central section that slides and a cursor to help read results, must be a slide rule. Such **Slide Rules for Colour** are rare but interestingly two versions were made for related but different markets – see Figures 11 and 14.

COLOUR – you see more than meets the eye

Except for the inherent emotional association of colours like **red** for "stop" and **green** for "go", we mostly take the many subtleties of colour and how we see them for granted. If asked to show the range of colours we can see, many of us would probably have to fall back on the "splitting white light through a prism" experiment from our schooldays (see Figure 1) or the visible colours of a rainbow. But even when ignoring the colours in the infrared and ultraviolet ranges that the human eye cannot see, the spectrum of colour variations we potentially can distinguish is staggeringly about 10 million. This is because any colour is foremost a combination of its **hue**[3], its **intensity**[4] and how **light or dark**[5] it is – making the number of subtle variations almost endless.

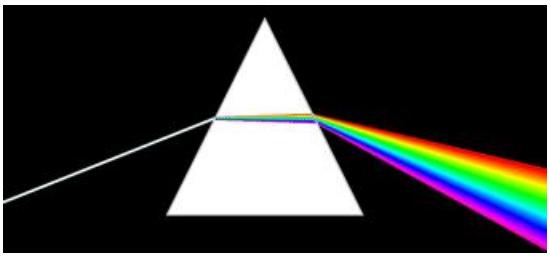
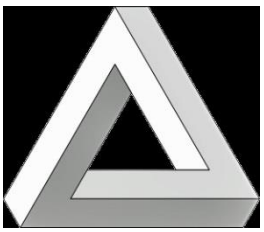


Figure 1. Using a prism to split light into its spectral colours

[1] "Borrowed" from William Shakespeare's play: *Romeo and Juliet*.
[2] If it looks like a duck, swims like a duck and quacks like a duck then it probably is a duck.
[3] The chromatic tone a colour gets from its wavelength or frequency.
[4] The chromatic purity of a colour expressed as its level of saturation.
[5] The chromatic lightness/darkness of a colour expressed as its level of "brightness".

Optical illusions



Yet despite their cleverness our eyes can deceive us. For example, optical illusions mislead our brains into seeing something which does not exist or is not as it appears. The "impossible Penrose triangle" or the engravings by Dutch graphic artist M.C. Escher (1898-1972) are well-known examples. Less familiar are similar tricks that colours can play.

Figure 2. The Penrose triangle

A large expanse of colour may look surprisingly different from a narrow stroke of the same colour – e.g. a long wall or just a door frame. Bands of dissimilar colours can unexpectedly look different when placed in a distinct order. Bands of colour can also look different when framed by a border. For example, painting one wall in a room a different or deeper colour than the others, changing the order of different coloured panels in a curtain or scatter cushions with or without a trimmed border.

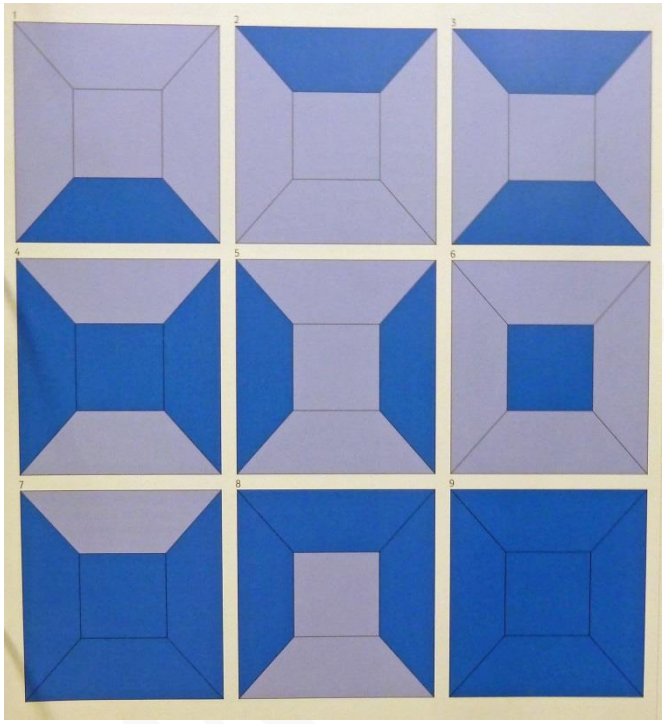


Figure 3. Impact of choosing different surfaces for a two-colour scheme

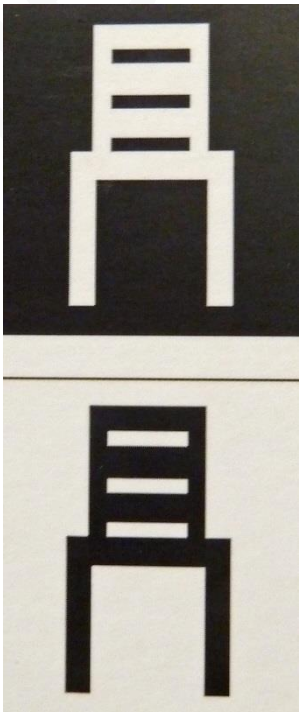


Figure 4. White on black versus black on white

The front elevations of all 9 "rooms" in Figure 3 appear remarkably different and the white chair in Figure 4 looks larger than the black chair. In reality all the rooms and both chairs are the same size. To highlight and use such inherent characteristics is why in the 1960s/70s two versions of a **slide rule for choosing colour combinations** were developed – one probably for "*Painters and Decorators*[6]*"* and another for *"Interior Designers*[7]*"*.

[6] It could also have been used by artists, architects or commercial representatives involved in the paint industry.

[7] It could also have been used by large furniture and home accessories stores or design consultants involved in the appearance of our homes.

Slide Rule for Colour

The open frame 30cm linear poly-slide duplex design of both versions is almost identical. At first, as shown in Figure 5, they look deceptively simple and almost "toy-like". Instead, and despite looking no more complicated than the scale layout on a basic Mannheim slide rule, the design includes some innovative and clever features not found on other slide rules. Instead of scales both versions have 72 different individual swatches of colour – 12 swatches on *both* sides of each slide.

Figure 5. Front left-hand end of the slides from both versions of the Slide Rule for Colour

The choice of 72 colours is ample as the slide rule palette is not meant to show all the possible colours. For that, large colour fan charts showing the many hundreds of colour variations possible were developed. For example, fan charts based on the **RAL** ("*Reichs-Ausschuß für Lieferbedingungen und Gütesicherung"*) or the **NCS** *("Natural Colour System"*) industry recognised colour specification standards. Proprietary alternatives such as the Sikkens **ACC** ("*Acoat Color Codification"*), a colour matching system for paint, also existed. Whereas the well-known proprietary Pantone **PAL** ("*Pantone Matching System"*) is more commonly used in the commercial printing business. By contrast the fundamental role of the Slide Rule for Colour is to: *"help evaluate, from a limited selection, how one or more different colours would look when combined (or separated)"*.

Figure 6. Fan chart of colours as specified by the RAL standard

The palette of swatches chosen does not conform to any standard industry or trade related colour scheme and is tellingly different for each version. For the *Painters and Decorators* variant each swatch of colour had to meet much higher quality control production standards. Examples of poly-slide rules[8] can be found throughout the history of the slide rule but they are uncommon. Usually the order of the multiple slides is fixed and regardless of the number, they are not normally interchangeable. However, on both versions of the Slide Rule for Colour reordering the slides is an important design feature. Therefore the horizontal edges of the slides are "tongue and grooved" like planks of wooden flooring. The respective "A | B | C" or "1 | 2 | 3" slide annotations (see Figure 5) give a default order but because of the tongue and grooving the slides can be (re)ordered in many different permutations.

Cleverly both cursors have internal tongue-and-groove channels so there is no "play" after setting the chosen order of the slides and replacing the cursor. This innovation also removes the need for the slides to run between a fixed top and bottom part of the stock or to have the end straps commonly found on open frame duplex slide rules. This "pick and mix" flexibility makes it easy to see how a particular swatch of colour combines (or not) with colour swatches of the other slides.

Figure 7. Side on view of the cursor showing the internal tongue-and-grooving

[8] A type of slide rule with multiple slides usually sandwiched between a fixed upper and lower part of the stock.

Alternatively the rule can be used to see how two colours are offset when separated by a third. This is an important function of the slide rule because, for example, colours can appear, as shown in Figure 8, significantly different depending on the neighbouring or the background colour.

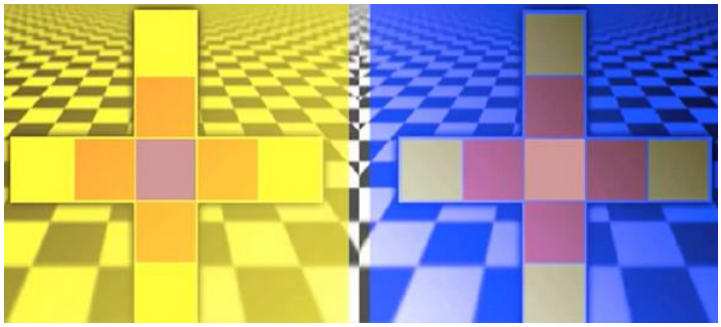


Figure 8. The squares of colour on both "Greek crosses" are identical!

However, not only is each slide double-sided but they are also reversible. The interchangeability importantly raises the number of possible 3-slide permutations[9] on each version to 48. This increases the potential of this highly unusual design. When the slides are aligned according to their respective default order (see Figure 5) on both rules, the swatches on each side are a mixture of high-intensity **saturated** vivid colours like "Fire engine red" and low-intensity **unsaturated** dirty colours like "Battleship grey". In the world of interior design combining saturated and unsaturated variants of the "same colour" as in Figure 9 has long been used to great effect and is known as "*Ton sur Ton*" or tone on tone.

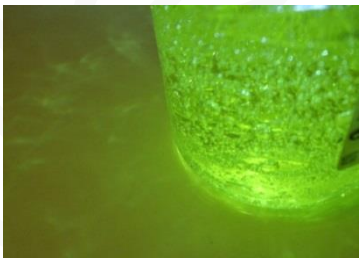


Figure 9. Matching shades

However, some of the 48 permutations appear redundant. For example, ordering the slides "A | B | C" or "C | B | A" (see Figure 5) means that the colour swatches on slide B are sandwiched between the same two slides – the top and bottom slides are merely interchanged. So once lined-up, being either the top or bottom slide appears insignificant. But there are situations when having a chosen swatch of colour as the top or the bottom slide is telling. On building exteriors especially it is common to choose a different colour and style of brickwork for the skirting or surrounds. As shown in Figure 10, depending on the order of the colour combinations chosen, the effect can be staggeringly different.

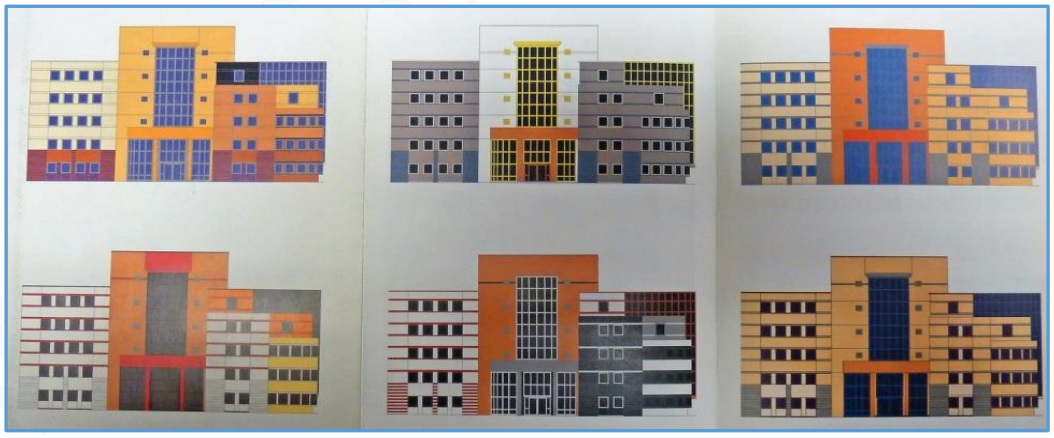


Figure 10. Different bands of colour combinations for the same building

So, all the possible 48 permutations contribute to the slide rule's overall functionality. Regretfully the inventor of the highly innovative Slide Rule for Colour is unknown.

[9] Permutations for randomly selecting 3 slides each with two sides = ($3! \times 2^3$) or 6 x 8.

Painters and Decorators version

Figure 11. Duplex 30 x 4.5 x 0.6 cm Painters and Decorators version with wooden slides and plastic cursor

With reference to paint, no colour can be adequately expressed just by its hue, intensity, and how light or dark it is. **Clarity** and **gloss** are two equally important characteristics when describing the "true colour" of any paint. This is why the colour swatches on the dark wooden slides (see Figure 11) in this variant had to meet much higher quality controls than the slides in the *Interior Designers* version. Any normal colour printing based process cannot accurately reproduce the subtleties needed for paint colours. The manufacturer of the *Painters and Decorators* version is unknown but from the spelling of the "COLOR SLIDE" trademark found on the front of the cursor and on the accompanying grey-blue thin plastic pouch, was probably American. Regardless of who was granted the trademark or sold the slide rule, they probably did not make the slides for it in-house. The slides would have been made by a specialist company and therefore expensive. Even today there are only a few select companies[10] who have the technology needed to reproduce faithfully to an RAL or NCS standard (or better) the true paint colour needed for each of the 76 individual swatches.

Figure 12. Trademark - probably US

The white plastic cursor is reversible. On one side there is a vertical "window" (see the top image in Figure 11) equal to the width of a single swatch. After setting the chosen swatches so the candidate colours for combining are vertically aligned, the cursor window can be positioned over them. Because of its width the cursor ensures that the focus stays on the three colours in the window and the eye is not distracted by any neighbouring colour swatches. As a rule-of-thumb it is considered unwise to use more than three different colours in a room. However, for exceptions the cursor window can also be positioned so that half of six neighbouring swatches are in view. As Figure 13 shows, the other side of the cursor offers 3 different cursor window options. On the left-hand side there is a series of 3 vertically aligned circular windows. This means that when the chosen colour combination is lined up, the colour swatches in the circles are isolated from one another. This overcomes, as explained earlier, the optical illusions colours can create when seen alongside each other. The half-height vertical cursor window in the middle is ideal when considering which colours to combine for say a large surface area on the inside or the outside of a home or building. The right-hand side full height but narrow vertical cursor window is the best option when considering colour combinations for small surface areas such as decorative trim or borders.

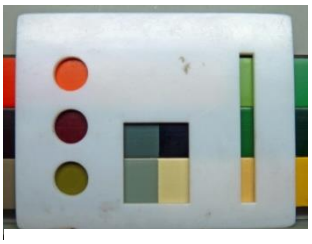


Figure 13. Extra cursor window options

[10] Such as: *Hellema Kleurkaarten*, Harderwijk, The Netherlands.

Interior Designers version

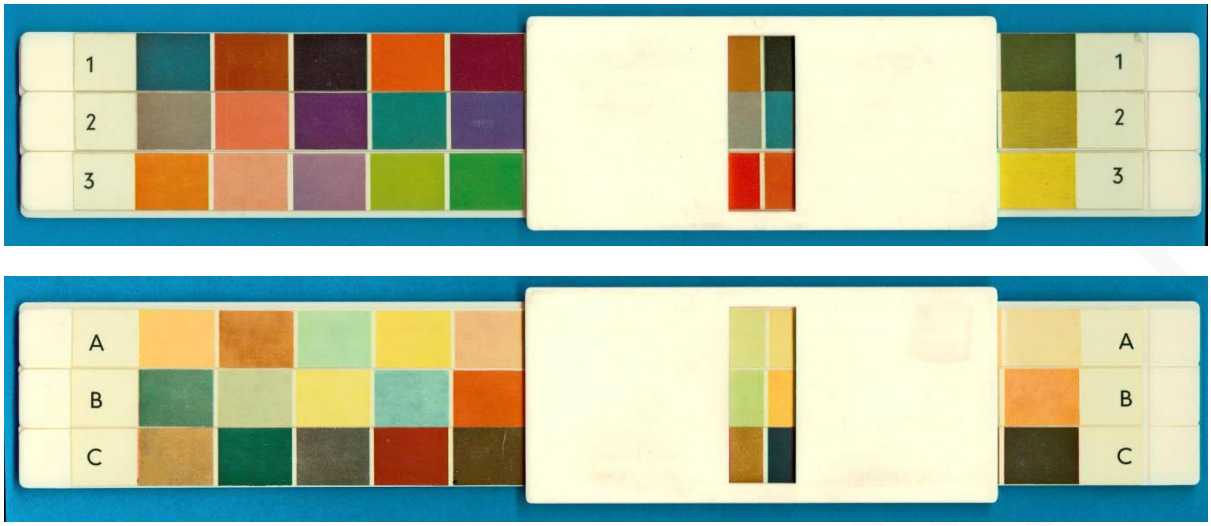


Figure 14. Duplex 30 x 4.8 x 0.8 cm Interior Designers version with plastic slides and plastic cursor

For paint the quality control of the colour swatches was extremely high. In the world of interior design this is less critical as textures, the use of fabrics, lighting, etc., also play a major role. Thus for this version a commercial printing process was sufficient. Paper strips of 12-colour swatches were glued onto both sides of the plastic slides. Interestingly the palette of colour swatches chosen is more orientated towards pale/pastel shades – see Figure 14. This may be a reflection of the colours that interior designers favour or because this version was made for the European market. There are no maker's hallmarks/logos or the trademark found on the *Painters and Decorators* version. Instead the only clue to its origins is the German "***WK-Farbschieber***" (WK colour slider) printed on the imitation cream leather covered stiff cardboard case accompanying the slide rule. The WK abbreviation almost certainly refers to the highly respected German association for exclusive furniture makers and distributors: ***"WK-Wohnen"*** (WK living). The WK association[11] was founded in 1912 and is still exists. Although on its 100th anniversary it was taken over by *Musterring International*, a German supplier of furniture and furnishing products. In its heyday affiliated *WK-Wohnen* members were synonymous with quality craftsmanship in furniture and furnishings. Early on the association even established its own brand name, ***"WK-Möbel"*** (WK furniture) - a label that stood for "design living". According to an item published as part of the *"News from the Industry"* column in a 1966 edition of a Swiss trade journal ***"Bauen + Wohnen"*** (construction and living), the "WK-Farbschieber" made: *"choosing the right colours for the home easy!"* The news item went on to say it had been developed in cooperation with the German "*Institute for the Psychology of Colour"*.

The *Interior Designers* version had an extra-wide reversible cream plastic cursor. However, both sides of the cursor have a single vertical window (see Figure 14) equal to the width of a single swatch. It is used in the same way as the *Painters and Decorators* version except it lacks the extra cursor window options offered on one side of the *Painters and Decorators'* cursor. In 1966 the *Interior Designers* retailed in Germany for 28.20 Deutsche Mark (DEM) or about 15 Euro. However, when adjusted for "purchasing power" today, the retail price would be well over 200 Euros. It probably predates the *Painters and Decorators* version.

[11] Full name: "*Interessengemeinschaft Deutsche Werkstätten für Wohnkunst*".

COLOUR: a language in its own right

Although different there are so many identical novel design features that both versions of the Slide Rule for Colour must be considered "siblings". Only two examples of the *Painters and Decorators* version and one example of the *Interior Designers* version are known to exist in collections. This maybe because only a few were ever made – there would certainly only have been a limited market for both versions and, of course, there were also alternatives. Tables in industry related books and aids such as "Colour Wheels[12]" existed as guides to colour matching. Even so, such Slide Rules for Colour must have been well-known by trade specialists and popular in their day as they were a simple but powerful way to choose colour combinations for maximum effect.

Today, modern smartphone "apps" can help us make such colour combination choices. But old-fashioned analogue fan charts still exist because when displayed on a phone or tablet screen any colour is only a poor facsimile of its true colour. Forerunners to such apps would have probably replaced the functionality of the Slide Rule for Colour by the 1990s.

Some collectors may not accept that the Slide Rule for Colour is a slide rule. However, none could contest that pairing a slide rule body with colours rather than scales creates an innovative aid. The science of colour is complex but when well-chosen **COLOUR** can grab our attention and be either relaxing or irritating to the eyes. Moreover when colours are effectively combined they can send out a powerful message – understandable in any language.

Postscript - it's a small world

The idea for the article was born shortly after a Slide Rule for Colour (*Interior Designers* version) became part of my collection in 2007. But it took me seven more years to finish the story. It was not a shocking case of "writers block" but for years I could not find any rational purpose for a Slide Rule for Colour or work out how it could possibly have been used. Ironically the answers were waiting for me in a former museum in my own hometown!

Acknowledgments and Bibliography

It took dogged persistence and some expert help to solve the mystery. I am indebted to Henny Brouwer for brokering the "golden tip". Henny used her extensive network of contacts as a university lecturer of Architectural Conservation and as a senior architect for the Ministry of Housing, Spatial Planning and Environment to check for any provenance. One contact, Mariël Polman, a colour expert of the Netherlands Cultural Heritage Agency and a member of the University of Amsterdam (UvA) Faculty of Humanities, remembered that a similar slide rule was part of the *Sikkens*[13] *Paint Museum* collection in Sassenheim. In 2012 the museum was transformed into the *Sikkens Experience Center* (SEC) with much more of a focus on present and future developments without forgetting its past. Today it is an interactive and inspiring showcase of everything related to colour, offering meeting rooms and tours.

The SEC put me in contact with one of their volunteers, Hans Vrijmoed, who arranged for me to see and examine the Slide Rule for Colour (*Painters and Decorators* version) from the museum's inventory. More importantly, as a retired colour specialist, Hans could tell me that it was actually an aid for combining rather than selecting colours and he could even show me how it was used in the past. Not only was this a "eureka moment" but Hans also patiently explained the technical aspects of colour that needed to be understood to make sense of the development of Slide Rule for Colour. Finally, I am also grateful to fellow collector Wolfgang Harder who sent me information and images of the Slide Rule for Colour (*Painters and Decorators* version) in his collection.

[12] For example, the colour circles developed by German Chemist and Nobel Prize winner: Wilhelm Ostwald (1853-1932).

[13] A Dutch paint company with a 200 year history that became an international market leader in coatings and is now part of the multinational AkzoNobel group of companies.

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