

BA Graphic Design

Research in Practice (ADAD5004/C)

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Introduction

How well hidden is graphic design in everything we see and learn about? What we might not realize is how easily the connections between our topics of interest and graphic design are hiding in plain sight. In this essay, I will be elaborating on this statement by focusing on three keywords and exploring their links to graphic design.

The three keywords I will be focusing on are physics, mathematics and surfing.

Although these topics seem unrelated to graphic design, I will be researching work of artists such as Bridget Riley; an English painter renowned for her work with optical illusions (Tate, 2025) and how the laws of physics mirror the structure of her work; I will also be exploring whether mathematical topics such as isometry act as a hidden language in the world of graphic design; and lastly I will be exploring the influence of graphic design upon the visual identity of surfing.

Physics

A branch of physics I will firstly be exploring is optics, the 'science concerned with the genesis and propagation of light' (Britannica, 2025). The concept of optics is concerned with the properties of light and 'their demonstrations can be grouped together and classified under one of three heads: geometrical optics, wave optics, and quantum optics' (Jenkins, F. & White, H.E, 1976, H. p.3); I will be investigating the characteristics of wave optics and how present they are in the world of design. As designers, experimentation is a fundamental element to our research and development work, which eventually leads us to our idealized final design. Through experimentation, physicist Thomas Young discovered 'the existence of the wave theory of light'

(Tolansky, S, 1964, p.66) and the interference of light waves where 'if two waves are in the same place at the same time, they produce an effect which is equal to the combined effects of the two waves' (Muncaster, R, 1989, p.447). In 'Young's double-slit experiment' (Muncaster, R, 1989, p.447), he discovered that when a coherent source of light falls on a double slit arrangement, a pattern of dark and bright fringes appear on the screen behind; these contrasting colours are caused by interference. A coherent source is 'a beam of radiation of a single frequency' (Britannica, 2025) and therefore consists of a monochrome colour.

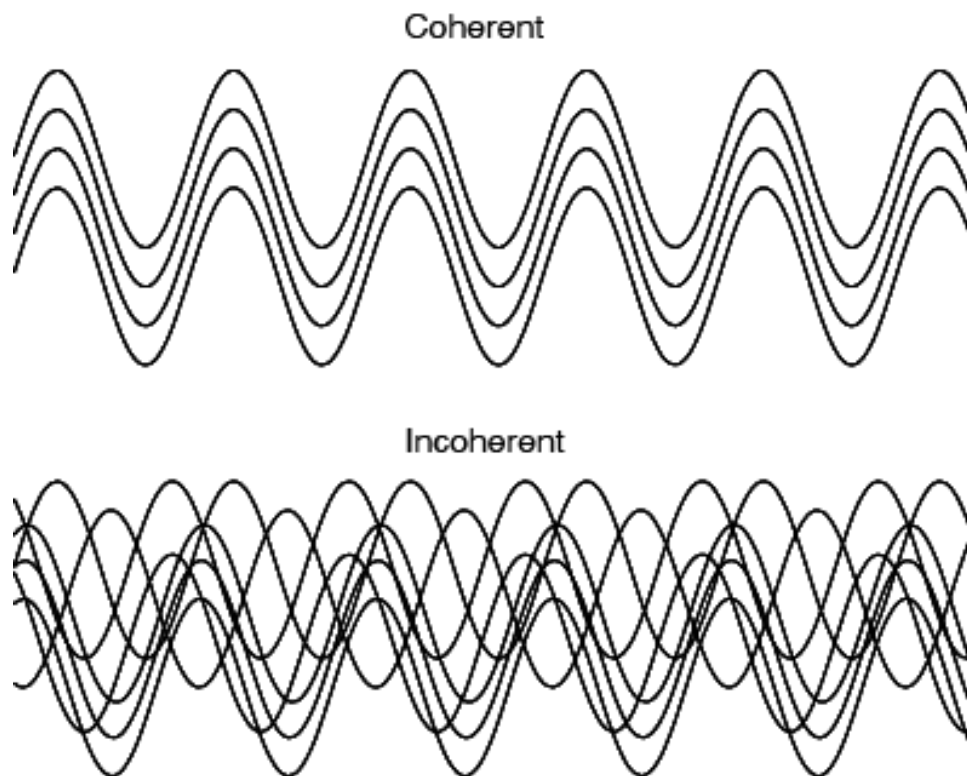


Figure 1.1 CCNY Physics Labs, 2025, 'Coherent light'

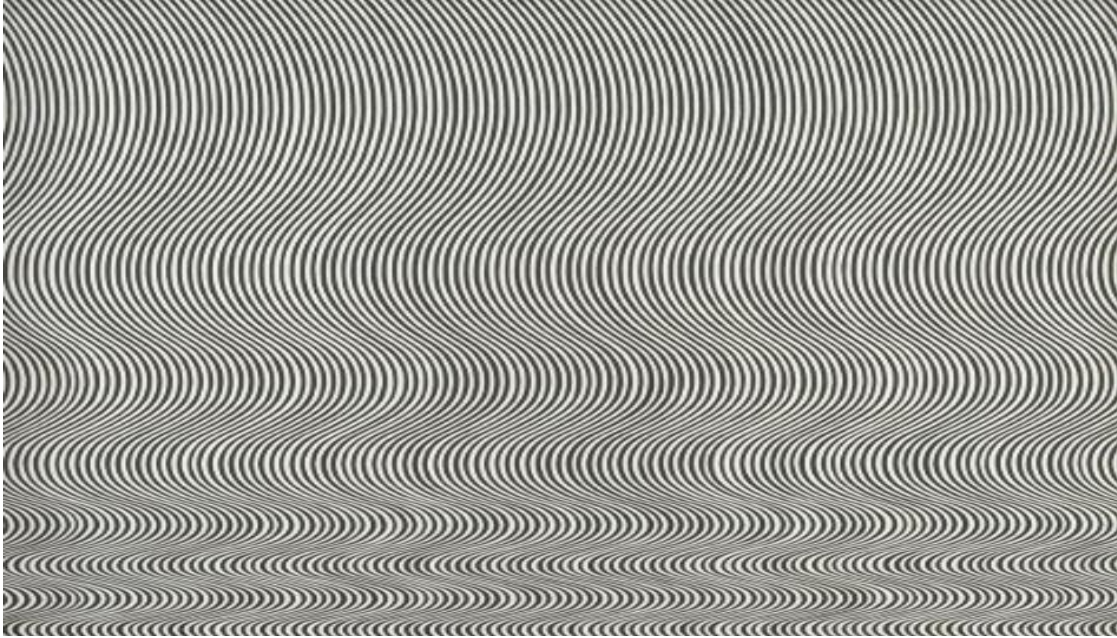


Fig 1.2 Bridget Riley, 1963, 'Fall' (Artnet, 2024)

A designer who uses monochrome within their work is Bridget Riley; 'a British artist known for her singular Op Art paintings' (Artnet, 2024). Figure 1.2 demonstrates the optical illusion element in her work combined with a monochromatic colour palette; these contrasting colours and wave patterns mirror the characteristics of wave interference and coherent light. Through manipulating contrast, it succeeds in creating illusions of motion and depth, replicating the interactions of light waves. However, Riley's work does not demonstrate scientific accuracy of wave interference but instead reflects its perceptual effects. This painting simulates physical light wave interactions by arranging visual elements meticulously and Riley's work is an inspiration in bridging science and design. Through contrast, controlled distortions and repetition, these demonstrate that scientific principles can create captivating visual experiences.

Physicist Christian Doppler also studied waves but through the medium of sound. He discovered 'when there is relative motion between a source of sound and an observer, the observed frequency is different from the emitted frequency' (Breithaupt. J, 1990, p.253); known as The Doppler Effect. This discovery became an invaluable part of physics where 'astronomers use the Doppler effect to calculate speeds of distant stars and galaxies' (Breithaupt. J, 1990, p.255). Astronomers discovered 'stars moving towards Earth show a blue shift' (Breithaupt. J, 1990, p.255) and 'stars moving away from the Earth show a red shift' (Breithaupt. J, 1990, p.255). These descriptions of colour refer to the visible section of the Electromagnetic spectrum where 'every hue has its own wavelength which determines its place in the spectral order' (Eiseman, L. p.12); red shift and blue shift referring to 'red having the longest wavelength and violet the shortest' (Eiseman, L. p.13).

This terminology of duotone to describe the magnitude of energy levels and the velocity of stars questions us as designers on whether we should be more considerate of the colour palette we choose and how impactful we want our designs to be; whether it's more effective to use a limited colour scheme as opposed to the range of colour palette within the spectral order.

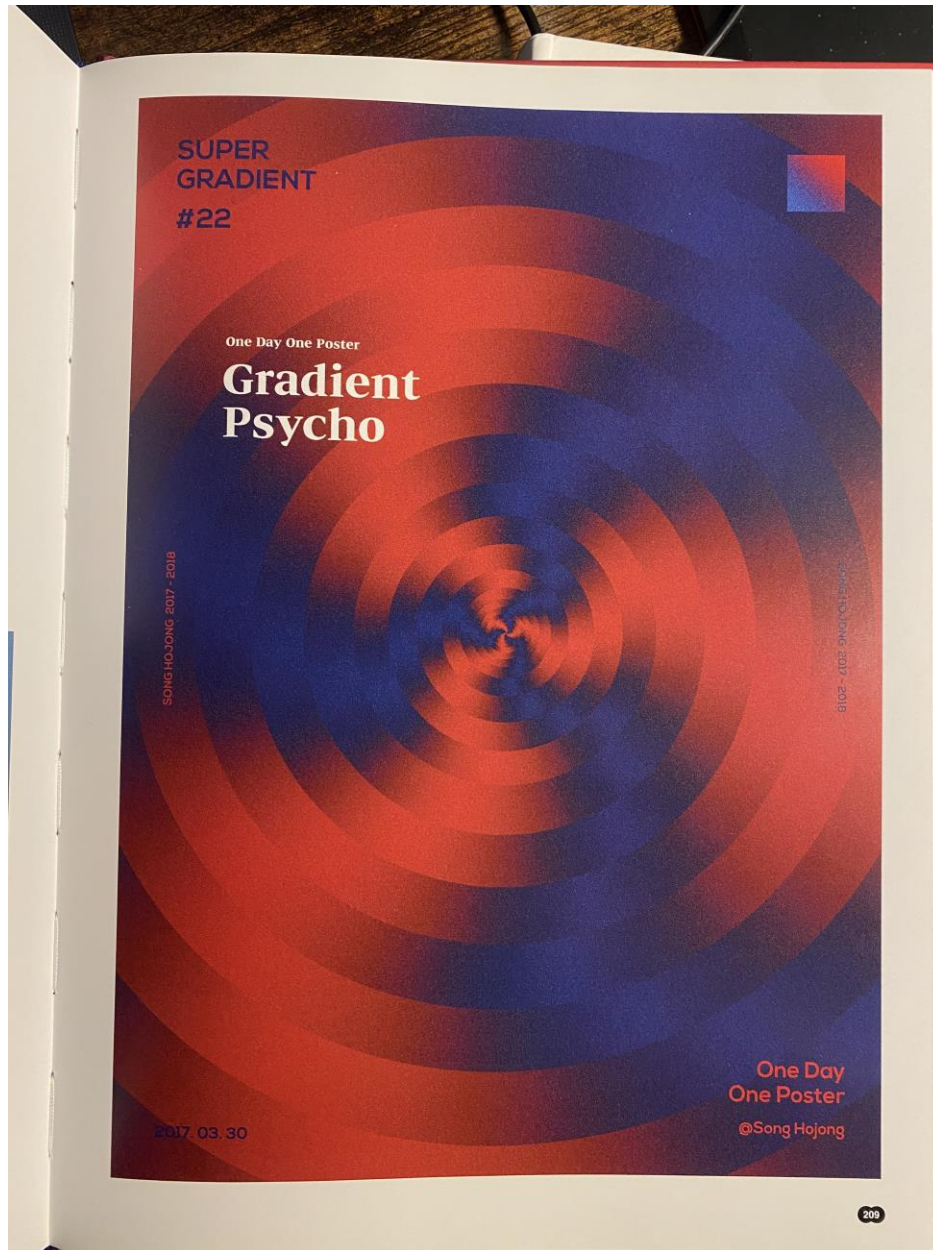


Fig 1.3 'Song Ho Jong, 2017, 'Super Gradient' (DuoTone, 2018, p.209)

Linking The Doppler Effect, here is a poster that uses blue and red as its colour palette. This limitation of colour reflects minimalism, which forces designers to prioritize the essential elements and influences a stronger visual hierarchy. In addition to this, red is 'the color of great contrasts' (Eiseman, L, 2017, p.28) combined with blue, described as

'the flow of communication' (Eiseman, L, 2017, p.30) which succeeds in enhancing impact and legibility.

However, if we as designers wanted to convey certain emotions through our designs, we would likely struggle using a limited colour scheme. Although red and blue are recognized as emotions such as 'passionate' (Eiseman, L, 2017, p.29) and 'calm' (Eiseman, L, 2017, p.30), more colour variation would be required for our designs to speak louder volumes on behalf of the bold impacts we intend to convey.

Mathematics

In some designs, although we may not see numbers, have we ever wondered whether there was a mathematical influence on that design? To argue that mathematics is a relevant topic within Graphic Design, I will be exploring whether it acts as a hidden language by analysing certain topics seen within examples of design work.

The first topic I will be exploring is isometry, defined as 'a transformation that preserves distances and angle measures' (Henderson, D. W. & Taimina, D, 2020, p.138). Isometry deals with transformations and repetitions of shapes on a plane which is a 'geometrical concept of a flat surface with no edges or thickness' (study.com, 2025) and types of isometric transformations include 'either a reflection, a translation, a rotation, a horolation, a glide reflection, or the identity' (Henderson, D. W. & Taimina, D, 2020, p.146).

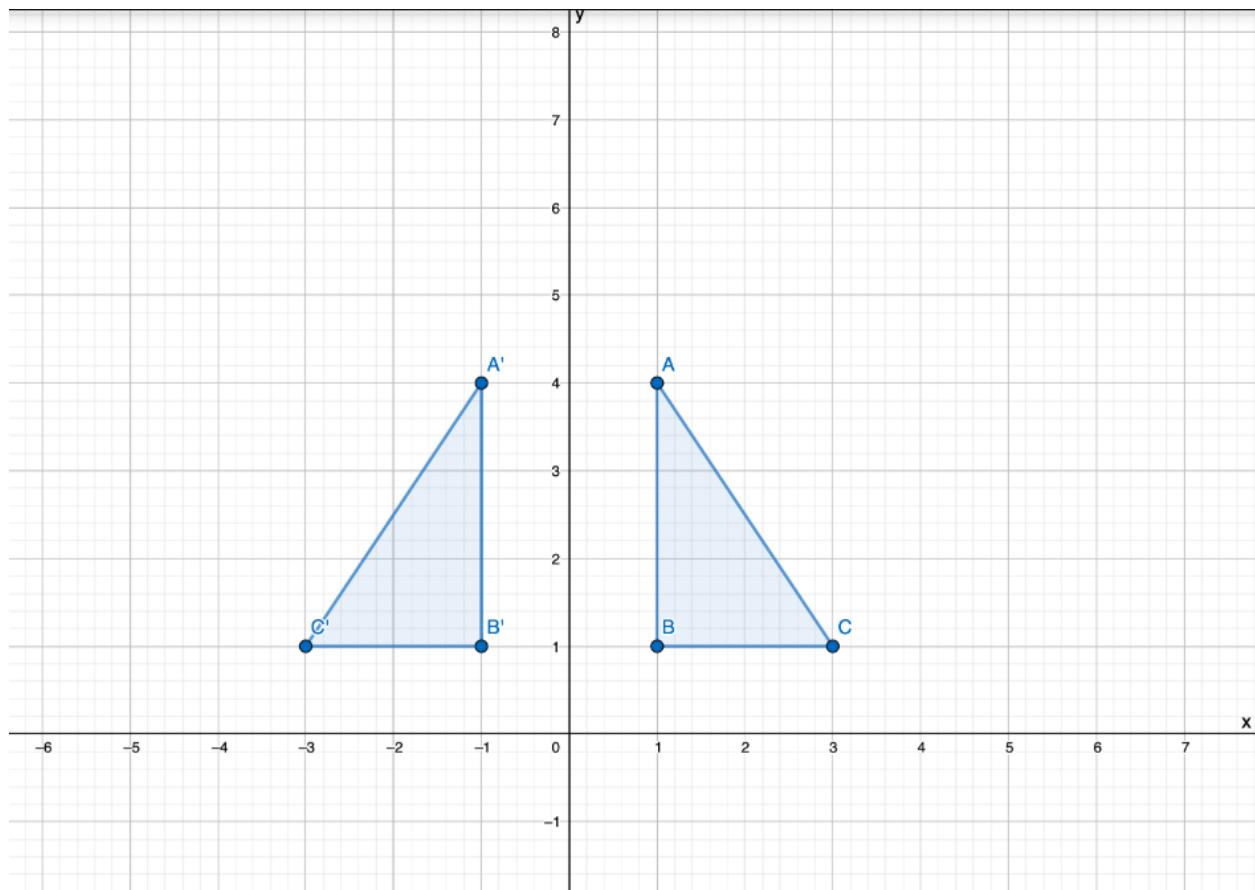


Fig 2.1 Study Smarter, 2022, 'Isometry: Meaning, Types, Examples & Transformation',

Here is an example of where the x coordinates of a triangle have been multiplied by minus one to give an identical mirroring triangle left to the y-axis; known in terms of isometry as a reflection.



60 AVON printed cotton. Possibly designed Dearle c. 1887. Block-printed Merton Abbey. Repeat: 29×35 in (73.5×89 cm). Width: 36 in (91.5 cm). Patterns: 6737, 7562. Design: Walthamstow.

Fig 2.2 William Morris, 1887, 'Avon printed cotton' (Parry. L, 1983, p.157)

Expanding on the theme of reflection, here is a piece of work created by William Morris, 'the single most important figure in British textile production' (Parry. L, 1983, p.6). The design demonstrates a geometrical influence upon its structure with the element of repetition seen within the patterns.

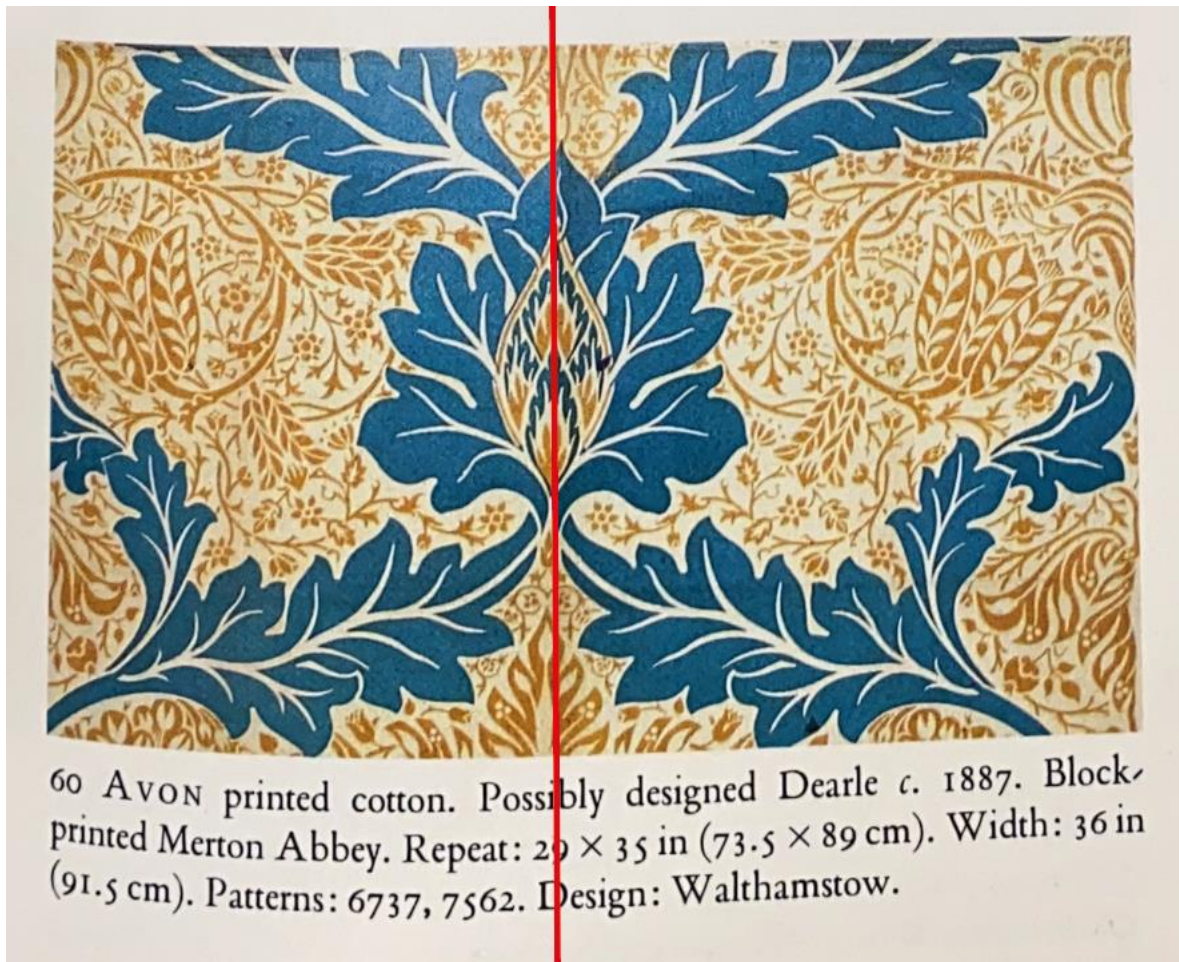


Fig 2.3, grid columns on the image reference fig 2.2

Drawing a vertical line on the design to mirror the y-axis of a mathematical plane, we can see from the image that Morris designs one section of artwork and then this section is reflected on the other side of the vertical line and hence completes the design. This geometrical description of the structure of the design highlights the influence of isometry, and although we may have to decipher these mathematical elements by drawing grid lines on designs, this suggests that isometry acts as a hidden language in the structure of William Morris' work and other designs involving patterns. This also leads us to question whether mathematics was a hidden factor that helped William

Morris stand out as 'a pattern-maker of genius' (Parry. L, 1983, p.6) and whether it will help influence more brilliant designs in the future.

After seeing the influence of mathematics upon a design from the 19th century, has mathematics helped designs evolve to the ones we see today?

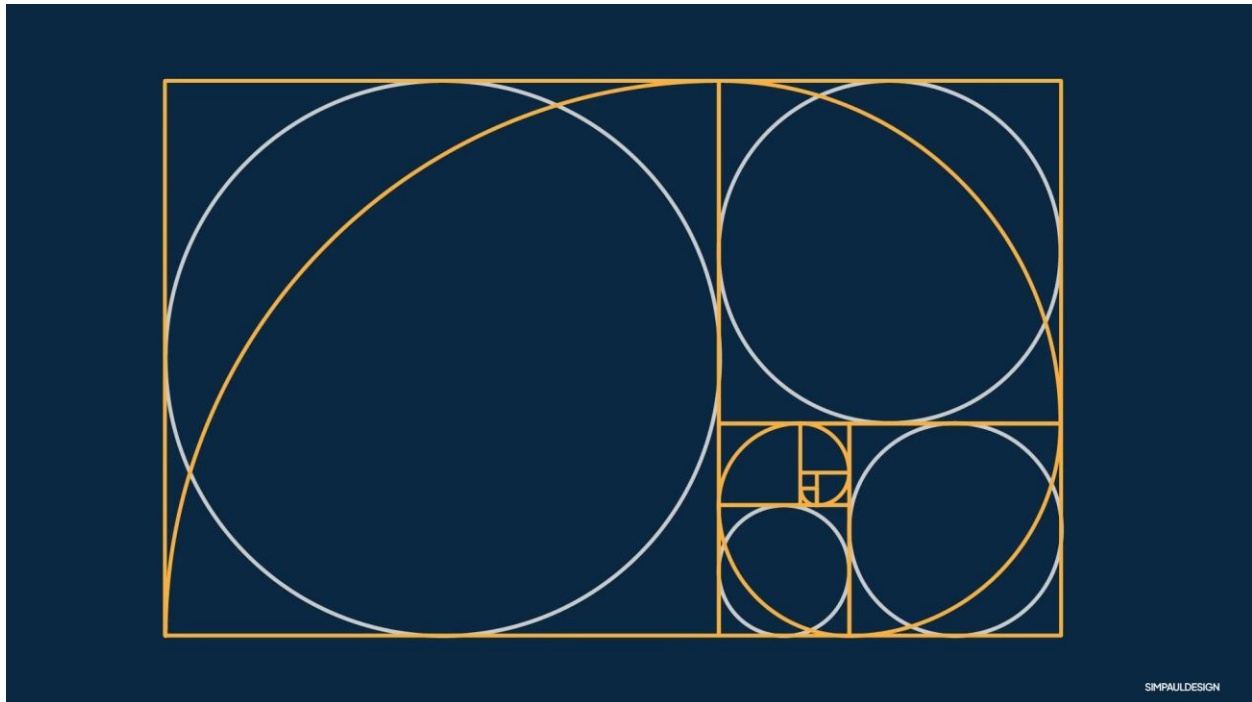


Fig 2.4, Simpaul Design, 2025, 'The Golden Ratio'

Figure 2.4 demonstrates the structure of The Golden Ratio which 'is an ancient mathematical ratio designers apply to get the most pleasing proportions of shapes and structures' (Simiyu, P. 2025). A ratio is defined as 'the relationship between two groups or amounts that expresses how much bigger one is than the other' (Cambridge Dictionary, 2025) and this ratio was derived from a Fibonacci sequence where 'each number in the sequence is a sum of the two preceding numbers' (Simiyu, P. 2025). With the numbers increasing, this creates a ratio of 1:1.618 between them, which can be written as the equation $A/B = (A+B)/A = 1.618$ (Simiyu, P. 2025); a useful tool within

Graphic Design so that 'designers can meet a layout's aesthetic demands without doing too much design work' (Simiyu, P. 2025).

$$\frac{A}{B} = \frac{(A+B)}{A} = 1.618$$

Fig 2.5, The Golden Ratio equation demonstrated on Adobe Illustrator

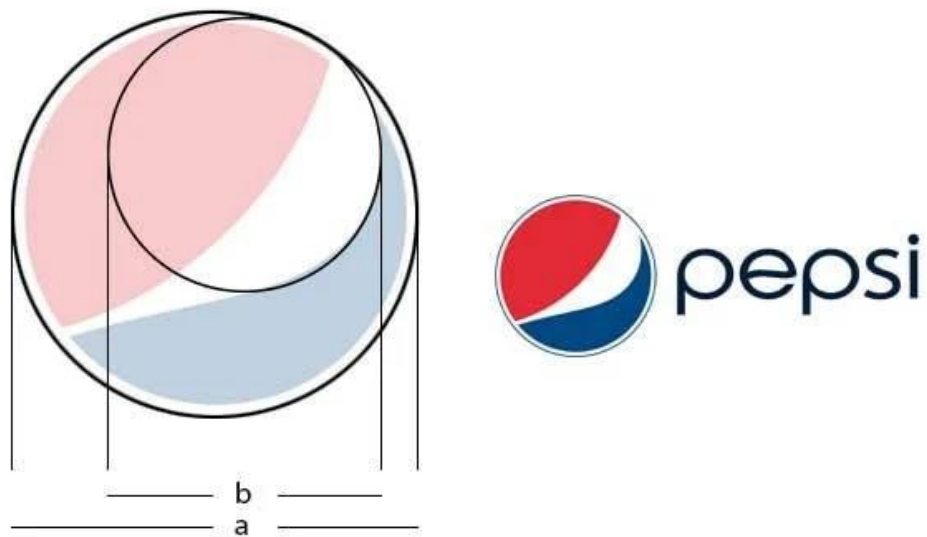


Fig 2.6, Canva, 2025, The Pepsi logo with The Golden Ratio

Figure 2.5 shows the Pepsi logo and a diagram highlighting its structure. This logo is renowned within the world of Graphic Design as 'The Pepsi logo stands as a symbol of enduring brand strength' (Woven Agency, 2024). Throughout the evolution of the brand's visual identity, elements 'including the golden ratio, the Earth's geo-dynamo and magnetic fields, and the theory of relativity' (Woven Agency, 2024) were used to develop the logo. Figure 2.5 also highlights that by dividing the diameter of circle 'a' by the diameter of circle 'b', a ratio of 1.618 is obtained (Canva, 2025), revealing the influence of the golden ratio behind the Pepsi logo.

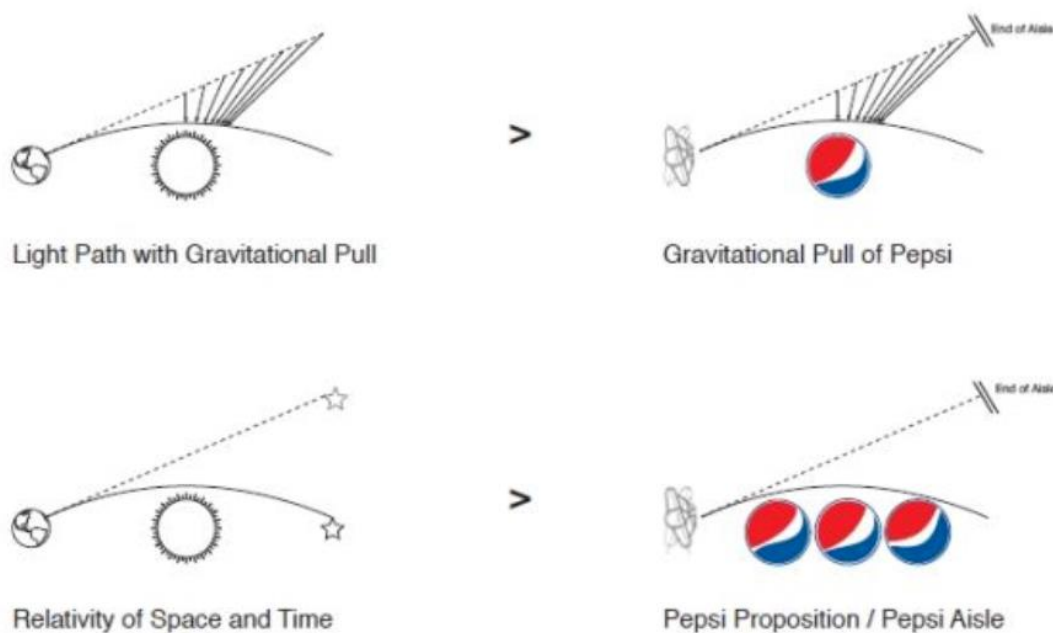


Fig 2.7, Woven Agency, 2024, 'Breathtaking Design Strategy',

Although 'the use of complex mathematical principles was deemed pretentious and unnecessary' (Woven Agency, 2024), we wouldn't know these principles were applied unless they had been demonstrated to us through diagrams. The link of the

mathematical influence that is hiding in plain sight and the structure analysis of The Pepsi logo demonstrate that mathematics and design work in conjunction with each other to create renowned logos; reinforcing that mathematics acts as a hidden language within Graphic Design and can be used to guide structure and beauty within visual identity.

Surfing

Although surfing is defined as 'the sport or activity of using a surfboard to ride waves toward a beach' (Cambridge Dictionary, 2025) some may argue that 'maybe, as some claim, it is even an art.' (Young, N. p.19). By exploring the evolution of the sport, I will also be investigating the influence of graphic design upon its visual identity and how it straddles modernism, freedom and nature; elements which have shaped how its visual identity is portrayed through design.



Fig 3.1, Paisleys of the 60s, (Young. N, 1983, p.84)

Figure 3.1 shows visually poetic surfboard designs from the 1960s where, during the same period graphic design also started to evolve with themes such as psychedelia, described as 'an honest reflection of the 1960s American youth culture' (Heller, S. & Chwast, S, 2000, S. p.210).



Fig 3.3, Sahirul Iman, 2018, 'Hendrix Groove'

Psychedelic graphic design then evolved and 'generated its own style of typefaces' (Cullen, C, 2001, p.138) like the retro Hendrix Groove typeface where it has been used on surf posters demonstrated in figure 3.3. Connecting the psychedelic elements with surfing, the wavy typography mirrors the experience of riding a wave and the organic style aligning with surfing's strong connection to nature. The use of the psychedelic typeface to represent the free-spirited element within the visual identity of surfing demonstrates strong symbolism of the sport through typography and reinforces its value of being an art through graphic design.



Fig 3.4, The End of Print: The Grafik Design of David Carson, 2000

As the sport evolved over the decades, so did its visual identity. Figure 3.4 shows a collection of surf magazine covers and surf graphics designed by David Carson, a designer whose 'commitment was to original expression, ceaseless exploration, an unending quest to originate and assimilate' (Blackwell. L, 2000, p.7). These magazine covers were designed in the 1990s where they demonstrate bold and modern typography. Although we can argue that the simple colours and characteristics of the typography highlight the hierarchy of the graphics, the modern approach and bold

typography of the magazine covers contrasts with the 'Hendrix Groove' typeface in figure 3.3.

The 'Hendrix Groove' typeface represented creativity and a free-spirited personality during the 1960s, which was then also used on surf posters to reflect those same elements the sport incorporates. Contrasting with the typography Carson uses for the magazine covers, where although they reflect modernism, it also demonstrates an element of seriousness about the sport which contradicts its values of being described as an art. This also leads us to question whether the change in surfing's visual identity within design over the years has also affected its visual representation as a sport.



Fig 3.5, Alan Green & John Law, 1969, Quiksilver logo

Figure 3.5 shows the logo of Quiksilver, 'the largest and most prestigious apparel company in the action outdoor sports industry' (Quiksilver, 2025). This 'logo symbolises excellence and authenticity' (Quiksilver, 2025), depicting a mountain and a wave to

represent its values of passion for the outdoors. This logo includes a modern typeface, like David Carson's designs, and it also reflects the organic theme of the Hendrix Groove typeface with the wave and mountain. We could even argue that the monochrome colour palette acknowledges the minimalistic design of some of the surfboards during the 1960s seen in figure 3.1.

After reflecting upon the evolution of surf branding up until today, we can argue that examples like figure 3.5 are a combination of elements throughout the history of surf branding. Even though the visual identity of surfing contrasted in development between the 1960s and 1990s, modern logos like these acknowledge and represent its history of visual identity development with the combination of different themes.

After reflecting upon the visual identity development of surf branding up until today, this suggests that for future development, brands and designers will proceed to include the values of the sport and acknowledge its history by including the same elements we have seen within surf graphics from the 1960s up until now.

Synthesis

Reflecting upon analysis of the three keywords: physics, maths and surfing, and their links to graphic design, the link between physics and Bridget Riley's work demonstrates that the laws of physics can influence captivating visual experiences. It highlights that mathematics acts as a hidden language within designs such as the Pepsi logo, and demonstrates that the subjects act as an underlying structure supporting visual composition. The visual identity of surfing represents physical and emotional interaction

with nature with the free-spirited typeface 'Hendrix Groove' gaining popularity during the same decade as the evolution of visually poetic surfboard designs.

Highlighting unique links to graphic design, mathematics creates balance and order with characteristics of logic and structure, laws of physics enable visuals to feel dynamic with a sense of realism, and surfing provides flow and identity whilst influencing emotion and culture within design.

Graphic design that acknowledges physics, mathematics, and surfing unfolds a convergence of motion, logic and feeling. Mathematics and physics offer foundational structure, and their laws guide function and composition within design; the theory of relativity and the golden ratio created renowned brands such as the Pepsi logo.

Mathematics hides in plain sight in surfing with its relationship of patterns and wave mechanics, where the spiralling characteristics of the Fibonacci sequence seen within the golden ratio mirrors the physical breaking waves on David Carson's magazine covers. Finally, the concept of physics and surfing are grounded in motion; the wave theory of light in Riley's work and the wavy typography of the Hendrix Groove typeface both expressing natural, fluid motion.

Further studies could include exploring surf culture and physical and mathematical structures seen in its visual identity; where their principles influence visual systems in surf graphics, such as posters, logos and typography.

Hence my research question will be:

'How do physical and mathematical principles reinforce the visual identity of surfing in graphic design, and how are these scientific structures translated into cultural and aesthetic expression?'

This question could lead to projects such as a Tide map calendar, a system that tracks wave data for 2026 in an aesthetically pleasing way; a strategy combining all three keywords.

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