The World According to Colour



A Cultural History

James Fox

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ABOUT THE AUTHOR

James Fox is Director of Studies in History of Art at Emmanuel College, Cambridge, and a BAFTA-nominated broadcaster. His many acclaimed BBC television documentaries include programmes about British art, Japanese culture and an enduringly popular history of colour in art.

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Penguin
Random House
UK

First published by Allen Lane 2021
Published in Penguin Books 2023
001

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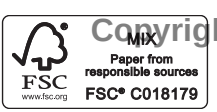
Typeset by Jouve (UK), Milton Keynes
Printed and bound in Great Britain by Clays Ltd, Elcograf S.p.A.

The authorized representative in the EEA is Penguin Random House Ireland,
Morrison Chambers, 32 Nassau Street, Dublin D02 YH68

A CIP catalogue record for this book is available from the British Library

ISBN: 978–0–141–97665–5

www.greenpenguin.co.uk



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Preface

I first started *seeing* colour at the age of six. It was one of those genuinely hot days that used to appear only once or twice in an English summer. I was drinking a glass of iced orange squash in the kitchen when a greenbottle fly entered through an open window. It rattled around the room for several minutes before settling on the table, at which point my mother leaped forward, swung her right arm and crushed the trespasser beneath a rolled-up magazine. I leaned in to examine the carcass, which twitched in a fetid pool of fluid. But even in that sorry state the insect looked like a precious jewel. Its eyes blushed with the deep burgundy of ripe cherries, its wings shimmered like miniature rainbows, and the emerald greens and sapphire blues on its abdomen exploded into copper and gold. I had never seen anything so beautiful.

All children are naturalists. We all start life fascinated by flora and fauna until, too often, our curiosity ebbs away. In my case, however, the fly triggered another, enduring, enthusiasm. As the summer rolled on, I became increasingly preoccupied with colour. In July and August, I counted the reds in the rose petals and the greys in the clouds, trapped butterflies in cupped hands just to see their pigments rub off on my palms and watched in fascination as our orange lawnmower painted green stripes into the grass. In September and October I collected autumn leaves in the school playground and arranged them in colour-coded rows, describing each specimen in a scrapbook with terms like 'frog green', 'bogey', 'wee yellow' and 'tractor red'. In later years I spent inordinate amounts of time reflecting on the curiosities of colour: why did cooked beef turn brown but chicken go white? Why was water transparent, ice grey and snow white? What

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colour was human skin, and – crucially – which crayon should I use to draw it?

Jean-Jacques Rousseau once remarked that the hardest things to see are the things we see every day. I'm sure that without chromophilia I would never have found such beauty in banality. Colour made everything worth looking at. I was twelve when I even began to perceive it in the dark. I would wait until nightfall, turn off the bedroom lights and close my eyes tight, then push down on my eyelids as hard as I could bear. As I jabbed and kneaded, the darkness around me lurched into life. Tiny pinpricks of light appeared and vanished like distant stars. Then, gradually, the monochrome murk erupted into oceans of amber, viridian and vermilion, washing left and right across my visual field. If the conditions were right, those colours coagulated into starbursts, spirals, chequerboards and matrices of glowing dots. I later learned that those mysterious forms were called phosphenes – tiny photons of light emitted by cells in the retina.

In retrospect my interest in art was inevitable. My first visit to London's National Gallery felt like a school-sanctioned trip to a sweet shop. I stumbled from one room to the next, eyes agog, mouth agape. I was rocked back on my heels by Sassoferrato's Virgin Mary, whose blue robe looked electrically charged, and by Goya's *Scene from the Forcibly Bewitched*, which contained a black so greasy that it seemed to slip off the canvas. Above all, I admired Claude Monet's *Bathers at La Grenouillère*. More than any other painting, it appeared to capture the way that colour tiptoes across our world. Monet's waterside scene is made and unmade by its hues. No sooner have the creams, blues, ochres and blacks become water than they wash away into colour again. The painting – like colour itself – is trapped in an endless oscillation between subject and object, light and matter. I particularly admired the scarlet dress at the left of the picture – a splodge of red paint that jars horribly with its surroundings, but in doing so flicks the canvas into life; if it wasn't there, the entire composition would collapse. I recall thinking that when Monet stepped back to examine that patch of red pigment, he must have smiled with satisfaction.

'Colour,' Monet once wrote, 'is my daylong obsession, joy and torment'. In the time I've spent writing this book, I confess I've often felt the same way. After all, once you begin to notice colour – *really* notice

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it – you can never escape it. It paints every corner of the world. It lies in wait for us to open our eyes and appears even when they are closed. But for all colour's ubiquity, for all humanity's tremendous advances in understanding and manufacturing it, we can never truly possess it. In many respects, colour's greatest challenge is that – like music – it resists most attempts to describe it. We have built vast lexicons to explain and classify it over the centuries, but our ever-expanding vocabulary of colour terms smothers its quicksilver referents like ill-fitting clothes. Colour might be one of those subjects that simply can't be written about.

But I couldn't resist trying.

Cambridge
August 2020

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Introduction

I hear the question upon your lips: What is it to be a colour? Colour is the touch of the eye, music to the deaf, a word out of the darkness.

Orhan Pamuk[1]

One day, a young Persian prince was wandering through his palace when something stopped him in his tracks. He had explored the building's every room and alcove over the years and thought he could navigate its corridors blindfolded. But now, in front of him, was a door that he'd never seen before. Finding it locked, he summoned the palace warden, who reluctantly gave up the key. A few moments later, the prince was standing in a room filled with gold, jewels and countless other treasures that sparkled like a thousand suns. His eyes soon settled on a series of paintings, depicting seven beautiful princesses from seven different realms. They hung in a circle around an eighth portrait, of a handsome king clothed in silver and pearls. Who was this noble ruler, and what had he done to deserve such attractive companions? The prince did not need to speculate for long. Above the painting a name had been inscribed: it was his own (**Plate 1**).

Bahrâm Gûr left the room but did not forget its prophecy. When he duly became king, he sent his agents all over the world to seek out the women he had been promised. Through bribery, blackmail and conquest, he acquired – then married – the princesses of India, Byzantium, Russia, Slavonia, North Africa, China and Persia. Bahrâm then built seven pavilions around his palace, dedicating each to a wife, her homeland, a day of the week, a planet and a colour. Once his wives

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had settled in their new homes, Bahrâm paid them a visit, spending a night with each over the course of a single hedonistic week. Each wife told him a story about love and virtue, before concluding with a plea for her own colour. 'There is no better hue than black,' declared his raven-haired Indian bride. 'Yellow is the source of joy,' insisted his blonde Byzantine spouse. 'Green is the soul's choice,' claimed the emerald-eyed Russian. The flame-haired Slav sang the praises of life-affirming red; the African princess rhapsodized about the celestial nobility of blue; and his Chinese consort listed the health benefits of sandalwood brown. But in the end, the fair Persian princess won the day. 'All hues with artifice are stained', she observed, 'except for white, which pure remains.' By the time Bahrâm Gûr had listened to her story, he too had been purified. His journey had taken him out of blackness, through the seven stages of life, and culminated in an apotheosis as white as snow.

The *Haft Paykar*, or *Seven Beauties*, is a masterpiece of Persian literature. Written by Nizâmî Ganjavî at the end of the twelfth century, it was inspired by Bahrâm V, ruler of the Sasanian Empire between 420 and 438 CE. But its other great protagonist is colour. Nizâmî's hues blossom like flowers across the pages, so vivid that one can almost smell them. But their purpose is far from decorative. Nizâmî saw colour as a microcosm of the universe – connected to the climes, days of the week and celestial bodies, as well as the seven-stage path towards enlightenment. He believed colour was a key to the hidden structures of the cosmos, one that could even unlock the mystery of life. This claim might strike us as implausible, but it wasn't at all unusual. People have always imputed such value to colour – convinced that the hues around us are not only beautiful but saturated with meaning.[2]

This book asks that we do the same as Bahrâm Gûr. We too will make a journey, visiting seven colours in turn and listening to their stories. But before we embark on this adventure, we should answer a question.

WHAT IS IT TO BE A COLOUR?

Augustine once wrote that he knew what *time* was – until he was asked to define it. The same might be said of colour. Colour, like time,

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is our constant companion. It's with us from the moment we open our eyes in the morning to the moment we close them at night. It surrounds us in every direction, in inexhaustible variety. Just take a moment to inspect the colours around you right now: I guarantee there will be too many to count. We spend so much of our lives experiencing these apparitions that we rarely pause to understand them. Most of us know what red or blue looks like, just as we know what a minute or an hour feels like. But we are much less confident when it comes to explaining them. If you are completely honest with yourself, do you *really* know what colour is?

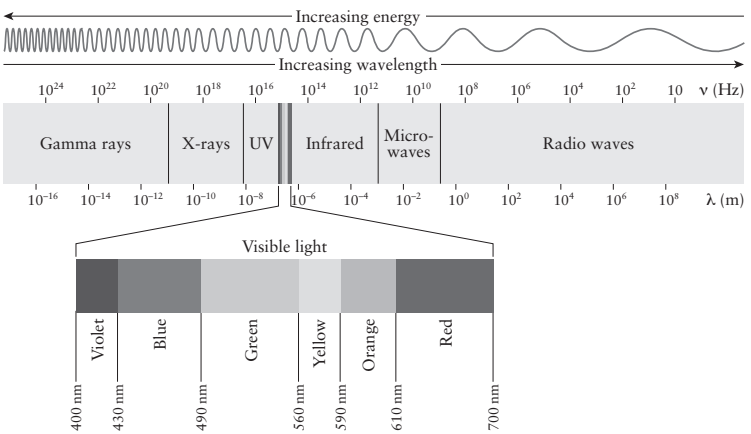
Many people take the commonsense view that it is an objective property of things, or of the light that bounces off them. They say a tree's leaves are green because they reflect green light – a greenness that is just as real as the leaves. Others argue that colour doesn't inhabit the physical world at all but exists only in the eye or mind of the beholder. They maintain that if a tree fell in a forest and no one was there to see it, its leaves would be colourless – and so would everything else. They say there is no such *thing* as colour; there are only the people who see it. Both positions are, in a way, correct. Colour is objective *and* subjective – 'the place,' as Paul Cézanne put it, 'where our brain and the universe meet'.[3] Colour is created when light from the world is registered by the eyes and interpreted by the mind. It is a labyrinthine operation, arising from a long chain of physical, chemical and biological events. This invites us to think of colour not as a noun but as a *verb*, and to swap the 'what is' question for a more useful alternative: *how does colour happen?*

It begins with light, because without light there can be no colour. Light belongs to a vast spectrum of electromagnetic radiation, which varies by wavelength and frequency. At one end of the spectrum gamma ray wavelengths are 100 million times shorter than a millimetre. At the other, extremely low-frequency radiation wavelengths are tens of thousands of kilometres long. The energy between them has many properties and functions. We use X-rays to photograph the insides of our bodies, microwaves to heat food and radio waves to communicate across great distances. But about a third of the way along the spectrum – sandwiched between ultraviolet (which burns our skin) and infrared (which we feel as heat) – is a small band of

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radiation visible to us. Though it makes up only 0.0035 per cent of the electromagnetic spectrum, visible light is responsible for all the colours that every human has ever experienced. At a wavelength of about 400 nanometres (there are a million nanometres in a millimetre), ultraviolet blossoms into violet, then bleeds into blue (430–90 nm), then green (490–560 nm), yellow (560–90 nm), orange (590–630 nm) and red (610–700 nm), before slipping into infrared, and out of sight.

Light is made up of tiny packets of energy, known as photons, which are everywhere in astronomical numbers. If you are reading these words by a bedside lamp, its bulb is producing 100 billion billion photons every second – a million times the number of cells in your body. Some light sources are coloured – a basic laser pointer emits only red light with a wavelength of 650 nanometres, and traditional sodium street-lamps emit only yellow light at 589 nanometres – but our leading photon emitter produces light of all visible wavelengths. The sun smashes hydrogen atoms together to form helium, creating unimaginable numbers of photons, which hurtle through the solar system at 300,000 kilometres per second. They reach our planet in just over eight minutes, where they clatter through the atmosphere, bounce off clouds, get lost in forests and plunge into oceans. These violent interactions between energy and matter are the crucible of colour.



The electromagnetic spectrum

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All materials have different structures, which interact with photons differently. Some reflect much of the light and thus appear white; others absorb much of it and appear black. Most substances, however, reflect or transmit some wavelengths of light and absorb others. This is what makes them colourful. Rubies appear red because their structures reflect only long, red, wavelengths of visible light. Grass looks green because it contains an elaborate pigment molecule called chlorophyll that absorbs blue and red wavelengths of light and reflects the greens and yellows between them. The morpho butterfly creates its exquisite blues with physical structures. Its wings are coated with microscopic scales that knock white light out of phase, scattering only blue wavelengths with iridescent intensity. In nearly all cases, objects paradoxically take on the colour they *don't* possess – the one their surfaces reflect. But this reflected, refracted and scattered light has not yet become colour. That requires a perceiver.

Of the innumerable photons that bounce like pinballs around our planet, some find their way into our eyes, where 100 million photoreceptors lie in wait. The vast majority of these photoreceptors are rod cells, which aren't responsible for colour vision, but four or five million of them are cone cells, which are. Most humans possess three classes of cones. S-cones are particularly sensitive to short (415–30 nm), M-cones to medium (530–70 nm), and L-cones to long (555–65 nm) wavelengths of visible light. All cones contain a pigment molecule consisting of a curved chain of amino acids. When this molecule absorbs a photon, a double bond snaps, causing the chain to straighten and the molecule to change shape. This seemingly trivial incident, lasting just 200 millionths of a billionth of a second, underpins all human vision.

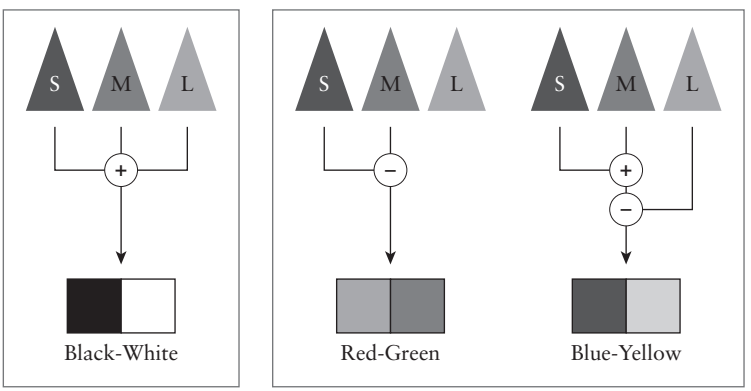
Light absorption triggers a cascade of events. When photoreceptors change structure they activate a protein, which activates another protein, which converts the scattergun chaos of photon absorption into electrical messages that are transmitted across synapses to bipolar and then ganglion cells. These messages are then turned into binary signals – on-off voltage changes called 'action potentials' – that exit the eyes through the optic nerves and careen along fluid-filled threads until they reach the primary visual cortex at the back of the brain. This part of the brain processes all kinds of visual material and sometimes sends it on to other areas in the occipital lobe for further

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processing. The machinations of the cerebral cortex aren't well understood – but we do know that it is primarily responsible for converting the light information registered by the eyes into the dynamic and colourful world we see around us.

How, then, is colour computed? Oddly enough, individual cone cells are colour blind. They relay no information about the wavelengths they absorb; only whether they detect light or not. But each cone type, as we've seen, is particularly sensitive to a specific range of wavelengths: S-cones are more likely to absorb blue wavelengths of light than their counterparts, while L-cones are more likely to absorb red. This allows the brain to compare outputs from the three classes of cones to establish which wavelengths are striking different parts of the retina. It does this by sorting the data into three separate channels – red–green, blue–yellow and black–white (this is why they are complementaries) – then measuring their differences by adding some signals and subtracting others. This exercise might seem bewilderingly abstract, but it is in fact both simple and efficient: from just three sets of comparisons, our brains are able to distinguish millions of hues and shades.[4]

This brief account has simplified many aspects of colour vision, but has, I hope, revealed colour as a *process* – a dance between subjects and objects, mind and matter. Different wavelengths of light exist independently of us, of course, but they don't truly become colour



The opponent process

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until our brains have finished interpreting them. Or, to put it another way, colour's ingredients exist outside of us, but its recipe resides within. The recipe, at least, is never the same. Like many largely subjective experiences, colour perception hinges on a great deal of interpersonal variety. Roughly 8 per cent of men lack one or more fully functional cone type and perceive fewer colours than others; a small number of women are thought to possess a fourth cone type, and thus an extra dimension of colour experience (though whether they can actually distinguish more hues is unknown).[5] In fact, every person's visual system is unique. No two will interpret identical light information in the same way.

The artist Josef Albers, who spent much of his career trying to decipher the mysteries of the spectrum, acknowledged as much at the beginning of his magnificent book *Interaction of Colour*:

> If one says 'Red' (the name of a color) and there are 50 people listening, it can be expected that there will be 50 reds in their minds. And one can be sure that all these reds will be very different.
>
> Even when a certain color is specified which all listeners have seen innumerable times – such as the red of the Coca-Cola signs which is the same red all over the country – they will still think of many different reds.
>
> Even if all the listeners have hundreds of reds in front of them from which to choose the Coca-Cola red, they will again select quite different colors. And no one can be sure that he has found the precise red shade.
>
> And even if that round red Coca-Cola sign with the white name in the middle is actually shown so that everyone focuses on the same red, each will receive the same projection on his retina, but no one can be sure whether each has the same perception.[6]

Perception is only part of the story. Colours also help our brains understand when to wake up and go to sleep, what to eat and buy, who to find attractive, and what emotions to feel. They are constantly influencing our mood and behaviour, though we're rarely conscious of them doing so. Red has been found to raise heart rates, increase electrical activity in the brain, contribute to sexual arousal, improve the body's speed, strength and reaction times, and encourage risk-taking and competitive behaviours. Blue is believed to reduce heart

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rates and blood pressure, promote relaxation and even reduce crime. These latter findings formed the basis of a famous initiative in Japan, where in 2006 several major railway operators installed blue LEDs on platforms and crossings around the country. They hoped that blue light would relax agitated people and discourage them from jumping in front of oncoming trains. The introduction of the LEDs duly coincided with an 84 per cent decrease in suicides.[8]

Today's consumers are constantly being manipulated by logos, adverts and packaging, which deploy colours to provoke specific emotional and physical responses. Up to 90 per cent of our snap judgements are determined by colour – decisions so immediate and subliminal as to be virtually irresistible. Shops use bright reds and yellows to catch our attention and arouse our interest, food and drink producers use reds and oranges because they are believed to stimulate appetites, and banks and insurers prefer blues because the public is said to associate them with honesty, loyalty, confidence and stability. All businesses know that colour is an essential component of a recognizable brand, and – in the case of BP's green or Cadbury's purple – they will go to court to keep control of it.[9]

THE MEANING OF COLOUR

What do we mean by meaning? There are perhaps three types of meaning as it pertains to colour. The first derives from the affective or psychological significance of hues and shades (red as energetic, brown as lethargic, light blue happier than dark blue). The second is created not by subjective responses but by codified social conventions (red signals indicating warnings, white flags denoting surrender). The third, and richest historically, is generated by association. Humans have been making this type of meaning for millennia. Philosophers, theologians, alchemists and heralds have created byzantine systems of correspondence all over the world, connecting colours to the planets, days of the week, seasons, climates, directions, elements, metals, precious stones, flowers, herbs, musical notes, letters of the alphabet, ages of man, humours, organs, tissues, orifices, tastes, emotions, virtues and vices. Some comparisons were logical; others less

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so. In his heraldic 'cullor' guide of 1610, Edmund Bolton identified yellow with topaz and chrysoberyl, Sundays and marigolds, faith and constancy, lions, the month of July, adolescence (specifically the ages of fourteen to twenty), air, springtime, sanguineness and the numbers one, two and three.[10]

Colours, of course, aren't inherently meaningful. Their meanings are created by the people who live with them. This is why a single colour can mean different things in different places. In the West, white has long been identified with light, life and purity, but in parts of Asia it is the colour of death. In English green is the colour of envy, but in French it is the colour of fear, in Thai of rage, and in Russian, sadness or boredom.[11] In US politics, red is conservative and blue progressive; in Europe, it is the other way around. These kinds of colour meanings also tend to change over time. Most people today think of blue as masculine and pink as feminine, and dress their offspring accordingly. But only a hundred years ago these metaphors were reversed. 'The generally accepted rule is pink for the boy and blue for the girl,' one parental guide instructed in 1918. 'The reason is that pink being a more decided and stronger color is more suitable for the boy, while blue, which is more delicate and dainty, is prettier for the girl.'[12]

All colours are ambiguous – even supposedly unambiguous ones. Black, which probably has more consistent connotations than any other, has been denigrated in virtually every part of the world through history, where it's been identified with darkness, despair, sin and death. But even this apparently irredeemable colour has its share of positive associations. In the last hundred years, it has become so synonymous with high fashion that all voguish products are invariably dubbed 'the new black'.[13] To Christian Dior, black was:

> The most popular and the most convenient and the most elegant of all colours. And I say colour on purpose, because black may be sometimes just as striking as a colour. It is the most slimming of all colours, and unless you have a bad complexion, it is one of the most flattering. You can wear black at any time. You can wear it at any age. You may wear it for almost any occasion. A 'little black frock' is essential to a woman's wardrobe. I could write a book about black . . .[14]

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Dior's 'little black frock' reveals, in a very simple way, the instability of colour meanings: if a woman wore a black dress to a funeral it would clearly symbolize mourning and death, but if she then jumped into a taxi and attended a nearby cocktail party, the same garment would signify stylish sophistication. Colour's meanings – like all meanings – are rooted in context.

But they can also transcend context. Colour preferences, for example, are startlingly consistent around the world. One recent study collected views from seventeen countries on five continents and found blue to be the most popular colour in every one of them. More remarkable still was the extent of its popularity: in every country it received at least a third of the vote. In Germany it was favoured by 47 per cent of subjects, making it four times more popular than second-placed red.[15] This global consensus likewise applies to some colour meanings – particularly on the first, affective, level. Most societies agree that red is 'hot' and blue is 'cold'; that yellow is 'active' and green is 'passive'; that 'white' is good and black is 'bad'; that bright colours are 'happy' and dull colours are 'sad'.[16] The same is true of our second mode of colour meaning. In an increasingly globalized world many colour signs and symbols have by necessity become universal. The Vienna Convention on Road Traffic stipulates that in all jurisdictions red should mean 'stop' and green mean 'go'. The International Organization for Standardization – which goes by the tagline 'when the world agrees' – insists that all hazards should be indicated by yellow and black.

But what of the third type of meaning? Can colour *associations* be truly global? The variations I've described indicate that they can't. Colour metaphors are complex constructions, shaped by the landscapes, languages, habits and beliefs of the communities in which they develop. Red – as we will see in Chapter 2 – is a lucky colour in China as a result of specifically Chinese circumstances, and green – as we'll see in Chapter 7 – is a lucky colour in the Middle East for Middle Eastern reasons. There are, however, a small number of colour metaphors that have appeared repeatedly, and with striking similarities, around the world over the centuries. These associations are based on what we might call universals of human experience – a handful of simple and stable reference points that all people have encountered, wherever or whenever they have lived. They are:

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Black	Night, darkness, dirt
White	Day, light, cleanliness
Yellow	Sun, fire, earth
Red	Blood, fire, earth
Green	Vegetation, water
Blue	Sky, water

At first sight they seem obvious to the point of cliché. But clichés are only clichés because there is some truth in them. The strength of these correlations, and the reason for their endurance, is their simplicity. They are grounded in resemblances so rudimentary that even crayon-wielding children can understand them. Over time this basic foundation of visual affinities has been built upon. Artworks, poems, treatises, rituals and everyday idioms have slowly piled up into into vast edifices of multicoloured meaning. This book explores how some of those edifices were constructed.

SEVEN BEAUTIES

Healthy humans perceive millions of different colours. In this respect our vision is superior to many other species. Most mammals don't possess the third class of cone cells sensitive to long wavelengths of light and are therefore red-green colour blind. Bulls might be famous for their hatred of red capes, but the red itself is invisible to them; they are actually enraged by the fabric's movements. Many animals, however, are thought to have superior colour vision to humans. Some reptiles, amphibians, insects and birds possess *four* classes of cone receptors. Several species of butterfly and pigeon have *five*. Bees see ultraviolet light, discerning elaborate patterns in flowers that are wholly invisible to us, while snakes see infrared radiation, which allows them to detect the warm bodies of prey from a distance. The eyes of the mantis shrimp contain as many as *twenty-one* classes of photoreceptor, sensitive to ultraviolet as well as polarized light – though the extent to which its small brain can exploit such hardware is unclear.

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Humans divide up these colours in various ways. The English language has eleven basic colour terms – black, white, red, yellow, green, blue, purple, brown, grey, orange and pink – but other languages do things differently. Russians possess two basic terms for blue – *goluboi* (голубой) for light blue, and *sinij* (синий) for dark blue – and think of them as entirely separate hues. A large number of languages don't have discrete words for pink, brown and yellow, and some use one word for both green and blue. The Tiv people in west Africa possess only three basic colour terms (black, white, red), and a few communities have no chromatic terms at all: the Burarra tribe in northern Australia divide the rainbow into *gungaltja* (light or bright) and *gungundja* (dark or dull). Colour vocabulary, like colour meaning, is largely cultural – it is dictated by context. Societies generally name only the colours they consider important. The Aztecs, who were enthusiastic farmers, possessed more than a dozen words for green.[17] The Mursi cattle-herders of Ethiopia have eleven colour terms for cows and none for anything else.[18]

Theorists also divide colour space into physical, perceptual and philosophical primaries. Their formulations likewise vary wildly, rising from two (usually black and white) and three (like our primaries red, blue and yellow) all the way up to the Optical Society of America's 2,755. No number, however, has proved more enduringly popular than seven. Aristotle believed there were seven 'simple' colours, as did Nizâmî and Isaac Newton. These thinkers didn't arrive at this figure because there *were* seven colours, but because the number itself had special significance. To Aristotle it was a salient integer, corresponding with the seven tastes and seven ages of man. Nizâmî's seven colours correlated with the days of the week and the planets. Newton separated white light into seven hues because he believed in universal harmony and wanted them to dovetail with the seven notes of a musical scale.[19]

This book follows the modern equivalents of Aristotle's seven primaries: black, red, yellow, blue, white, purple and green. I make no claim to be definitive – colour is far too protean for that – but I have tried as far as possible to honour my subject's ubiquity. The book roams from prehistory to the present, from one side of the world to the other, and draws on art, literature, philosophy, science and much else besides. My goal is to understand not only the physical properties of colour, but the

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meanings it has been given. These meanings reveal a great deal about the societies that produced them, reflecting their hopes, fears, prejudices and preoccupations. I have therefore arranged these seven colours in such a way as to tell another story, about humans and our place in the universe. Read it, if you like, as a cultural history of colour; though I think of it as a history of the world, according to colour.

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1

Black

Out of Darkness

The Black beauty, which above that common light,
Whose Power can no colours here renew
But those which darkness can again subdue,
Do'st still remain unvary'd to the sight,
And like an object equal to the view,
Art neither chang'd with day, nor hid with night
When all these colours which the world call bright,
And which old Poetry doth so persue,
Are with the night so perished and gone,
That of their being there remains no mark,
Thou still abidest so intirely one,
That we may know thy blackness is a spark
Of light inaccessible, and alone
Our darkness which can make us think it dark.

Edward, Lord Herbert of Cherbury (1665)[1]

Let us begin with a simple black square (**Plate 2**). It appears unexpectedly in a leather-bound book, like a hole that's been waiting for a clumsy reader to lose balance and tumble in. It is made from hundreds of individually engraved lines, woven atop and across each other into a crisp, pixely blackness. The ink has peeled and puckered over the years, and been smudged in places by roving fingers, but still emits the astringent odour of linseed oil. The execution is far from perfect – the square's sides are unequal, its edges wobble, and its cumbersome corners bleed into the yellowing paper around

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