The Colour of Light and its Effect on Objects
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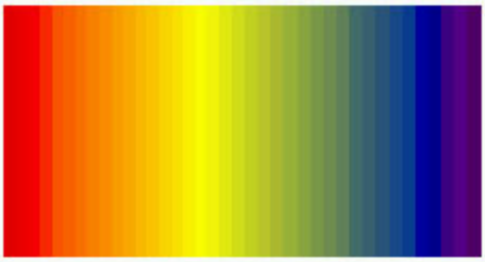

THE COLOUR OF LIGHT AND ITS EFFECT ON OBJECTS by
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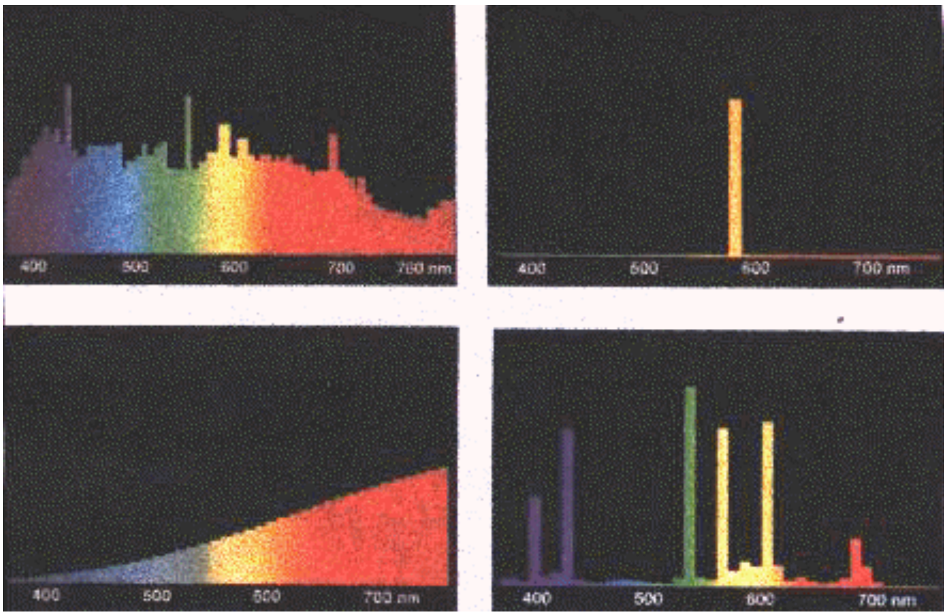
There are two fundamental aspects to how we define the effect of a determined colour on an object, the physical and the psychological. The physical aspect deals with the very nature of light and how it gives birth to colour, while the psychological deals with the correlations we establish between colours and environmental characteristics decisive to our bodily and mental adaptation to that same environment.
To firstly address the physical aspect, a brief historical contextualization is in or-der since the findings held today as nearly conclusive might yet be recalculated, being the scientific branch studying light so fairly recent as it is.
The curiosity towards the nature of what we see has naturally been one of the foremost philosophical and scientific debates of mankind. However, concise scientific knowledge of what light really is consists of a series of very recent breakthroughs.
We have come a long way since the days when Pythagoras claimed that we could discern vis-ual information because of rays that were emitted from our eyes in the direction of our gaze, but surprisingly, the most significant portion of this long scientific road has only been treaded during the last two centuries.
One of these recent breakthroughs was to confirm and bring together two different explanations for light, which had been consid-ered as opposite interpretations up until the beginning of the last century, one being that light travels in particles and the other that light travels in waves. The “waves” component of the theory accounts for a notion which had actually been considered for some time, stating that colours are the consequence of different frequencies in light radiation.
How-ever this had mainly been considered as a parallel to sound propagation, meaning a me-chanical transmission occurring within a hypothetical omnipresent element named ether. What the inclusion of the particles component of the theory brought about is that in contrast to the mechanical transmission hypothesis, light is considered to be a perpetually moving energy element, called photon, which in its undulatory movement is added or subtracted of determined vibrations due to interferences caused by absorptions, reflec-tions or refractions of material or electromagnetic nature, conferring it different vibration patterns which, in a given interval of the whole electromagnetic radiating spectrum, we perceive as colour. Light that is thus radiated from a light source and blocked by a certain material in its path, is absorbed, reflected and refracted in measures determined by the nature of that material,

conferring different electromagnetic properties to the resulting radiation.
When the many materials present in an environment modulate an electromagnetic radiation in ways proportional to their different natures, it is possible for an electromagnetic-sensitive organ to perceive some extent of the nature of those same materials, and it is that perceptible signature we call colour.
Colour however is not solely originated by means of obstacles that reduce certain spectrum ranges of a light source's radiation; the light source itself might produce an un-even emission that will render a chromatic appearance to the light it radiates. This chro-matic appearance is measurable by a concept named "colour temperature" which allows for light source classification. But before addressing this notion properly, the full implica-tion of temperature should be set as it not only affects our impressions towards light and colour but it is also intricately woven into the physical nature of light.
Much of what we discern regarding human sensorial-related deductions circle ob-viously around the data given to us by our environment, but not all environmental data has the same importance to define our reactions to the environment itself.
Of the entire information we absorb from our surroundings one attribute comes out as the foremost sensitive environmental incident: temperature. The implications of temperature extend themselves to all matter, but especially to fairly physically fragile living beings such as ourselves to whom warm and cold do mean an almost palpable feeling of comfort and discomfort.
Temperature thus contaminates all sense perception in such a way that we might end up attributing warmth to softness or coldness to acidity for example, but inso-far as colour and light are concerned, it defines two distinct poles for each of these, cor-relating temperature opposites to distinct colours and light intensities.
This contamina-tion by the temperature sensation in both colour range and light quantity carries of course a great amount of subjectivity, but it is nonetheless substantiated by the objective fact that light sources are by nature energy sources which, along with its visible radiations perceived as light, also radiate other electromagnetic radiations that stimulate matter in the form we know as heat.
An objective connection between heat and light was found when experiments were made on the radiating pattern of a solid body exposed to rising temperatures. It was noted that if a solid body was heated to a sufficiently high temperature it would begin to emit light, and this light was found to have a progressively different chromatic appear-ance as the temperature was heightened, starting from reddish in the lower temperatures, passing through white and ranging to bluish in the higher temperatures.
It is true that dif-ferent solid bodies behave in different ways but it was possible for scientists to extrapo-late the behaviour of an ideal solid body that would radiate as much energy as that ab-sorbed. The theoretical body of such properties was named "blackbody" and its radiating behaviour named "blackbody radiation".
Along with other conclusions on other subjects, this led to a way to measure the chromatic appearance of light quantified in temperature, meaning a way to tell which components of the visible spectrum are more present in the light of a given light source: the lower colour temperatures are richer in the red to yellow range of the visible spectrum while the higher colour temperatures are richer in the blue to violet range of the visible spectrum.
But colour temperature is not the only way a radiating spectrum might suffer from generalized spectrum range reduction. So far the objects exemplified have been opaque solids but if the object is translucent, the altered radiation will traverse the object rather than being reflected by it.
This electromagnetic permeability property of translu-cent objects might be used to the extent of completely changing the appearance of a given light, for such an object when placed in a light's radiating path will only allow pas-sage of the electromagnetic range that it would have reflected if it were opaque. This is called filtering and together with proper control of a light source's colour temperature, provides the illuminator with all the tools needed to create a desired effect on the illumi-nated objects.

Under such variegated lighting possibilities it is still possible to follow the initial notion that a determined object's colour is a radiation sifted through a collision with the respective object but now, with the added notions of colour temperature and light filter-ing, light sources are no longer assumed as having to radiate a linear spectrum.
Thus is added the possibility that depending on a given light's chromatic appearance, not all col-ours might become apparent. The initial radiation might have been deprived of the spec-trum excerpt relevant to an object's standard colour signature, and in such a case, only the radiating spectrum fraction that was present in the object's linear-light colour signa-ture will be reflected by the object.
The visible objects' colours will no longer be the ones we had as reference under normal lighting, leaving room for such possible chromatic phenomena as for example, in a terminal case, a set of objects with a wide array of col-ours, when lit by monochromatic light only present different intensities of one same col-our.
This raises two issues that are important to define when considering our whole visual perception standards and the deductions we draw from them.
One is identifying normal light which is naturally that which is radiated by the light source that has been accompanying life in this planet for as long as it has existed. The sun might not be the most linear light source conceivable, and due to our planet's round shape not even does shine the same way across the earth's surface, but it is the one that sets all standards. A person might not even be consciously aware of the direct impli-cations that different light sources project on the environment but if there's a need to properly discern an object's colour that person will surely unconsciously turn it towards the sun if possible.
This issue, though possibly seeming too obvious, is still quite impor-tant to properly assimilate because one who deals with light must interiorize and use to his advantage the fact that when a certain object is illuminated artificially, that object suf-fers an effect proportional to its displacement from normal lighting.
The effect might be directed towards a variety of emotional responses depending on both hue and intensity but the quantification of whichever emotional effect is heightened with the progressive alteration of the object's normal colour signature.



And as we delve into the general perception of an effect, we bring up the second issue mentioned above which is to know how we so thoroughly visually adapt to an environment that is supposedly so ever-changing. Here too the answer is of great importance to the illuminator and it might not seem as obvious as the previous one. We actually adapt to this perpetually changing environment in such seamless fashion because to our understanding the environment isn't as changeable as a linear reading would imply. The perceptible alteration steps aren't static; our saturation thresholds are dynamic depending on how long we are exposed to certain environmental conditions. Be it smell, taste, touch, hearing or sight, there's an habituation level working as a suspension mechanism so that we do not render ourselves hopeless in face of a bump in environmental condi-tions which would otherwise seem like a drastic alteration. In sight this reflects in the human optical system progressively countering a determined light's excessive unevenness with gain compensations on the spectrum ranges whose lower intensity constitutes the unevenness. That is why completely discrepant light sources such as common household discharge lamps function as acceptably linear to our eyes. As such, to properly accom-plish an effect the person illuminating must also take into consideration and use to his advantage the progressive conventionalization an environmental characteristic will un-dergo in human perception. In situations where habituation is an undesired side-effect we can study the com-position to see if it is possible to apply a contrasting element.

Contrast is one of the most dynamic environmental characteristics and recognizing its itinerant talent is not only an advantage to lighting but also an improvement to our sense deciphering abilities. It is so because our senses react to it with both an attention focus and a sensibility leveller. Whatever the nature of a certain abrupt divergence, wherever we see or otherwise sense that discrepancy, that is where we will turn our attention to. Furthermore, from the mo-ment our attention encompasses both extremes constituting the contrast, our sensibility, which would otherwise be able to adapt, will now be forced to act in a static mode setting the sensibility to an average between the two extremes. The presence of two antagoniz-ing forces will decrease the odds that we'll perceive the full extent of detail in either of them. Thus if for instance the desired effect depends on maintaining an obscure deep blue, then the way to ensure viewers will not see more and more of the low light detail will probably be adding a contrasting bright yellow somewhere in the composition.

The more we mention the reactions of those witnessing a light and colour effect on an object, the more we near the other major aspect to how we define that same effect, which is the psychological aspect; so far it has been exposed how we perceive colour, but as this exposition progresses so surfaces the underlying question which is to know how we interpret colour.

Yet try as I might, no psychological subject can be addressed without tackling the physical context; no emerging abstract emotion is deprived of a physical component to give it structure. Being so, the first thing to understand regarding how colours may alter our perception of an object must be the connection between colours and natural envi-ronmental characteristics, for they alone link our opinions about a determined effect and the actual colour there involved.

This somewhat subjective connection is best recognized if the opening correlation is based on the same major sensible environmental incident that was used before when tackling the physical nature of light.

Temperature remains the gateway for the tangible and intangible dealings between light and our existence. How-ever, even though the connection between temperature and light has already been con-firmed above, it is a confirmation which ironically contradicts the empirical conclusions established for this relationship, for while colour temperature attributes colours blue to higher and red to lower temperatures, our common sense observations towards our envi-ronment state the exact opposite, and this opposite relationship, being the psychological doorway to chromatic interpretation, will guide every light intervention one makes when considering an audience or a public usage.

Still it is simple enough to note why this opposition occurs. When solar radiation reaches our atmosphere, certain parts of its spectrum are absorbed and filtered by some layers of the atmosphere, namely the ozone layer which is dominantly responsible for ab-sorbing a range cluster that includes a part of the visible electromagnetic spectrum where the blue colour is contained.

Direct sunlight still makes the majority of the light reaching the earth's surface but the sky

tinted by the absorbed blue will also serve as a light source for indirect light.
When a determined spot in the earth's surface meets the sunlight per-pendicularly it is bathed by direct sunlight with such an intensity that it's reflections and refractions will create an indirect light strong enough to supersede the sky's blue tone il-luminating properties, but as that same spot on the earth's surface progresses towards a parallel location in reference to solar radiation, the sky's blue tint will growingly fill the areas deprived of direct sunlight, until at last once direct sunlight cesses to shine, blue is finally the only light source. Blue will still tint shadows well into the night until the re-ferred geo-location finds itself oppositely perpendicular to solar rays, point at which the cycle will begin again.
This environmental characteristic that gives our surroundings the colour blue when our natural heat source fades away is the key to understanding the psy-chological connection we make between colour and temperature. On the other hand, the association made towards warm colours is logical when considering that the high tem-peratures making up our common dealings with our surroundings are those of fire, in-candescence, melt materials, all of which brought forth by very low temperatures in the context of colour temperature, but still high enough to sign our sensorial correlations to the colours there involved. Oranges and yellows of lava and fire are the colours psycho-logically related to heat.
Aside from the rulings of fire and shadow over the colours we name as warm and cold, all remaining surrounding influences determine the way we dictate the effect of a colour, but on increasingly subjective levels. Blood for instance lends a very strong emo-tional response to the colour red, but there can be no definitive judgements of value for where one may see the courage in battle another may see the unexplainable fear of death. White is also commonly used for its linear reflective properties in hospitals, homes and all things best kept with a neutral appearance, but there is still no definitive psychological reading for this colour, for where one may see an unbiased purity another may see shal-lowness. Be it blood, earth, clouds, water or flora for example, from all of these rises a relatively consensual psychological chromatic effect, for all of these and many more carry a distinct importance to our environmental subsistence, thus contaminating our percep-tion in a semiotic process of identification. Of course this does not mean that we should only use light with warm chromatic appearances simply because they transmit a more comfortable sensation, nor does what has been exposed so far carry any absolutist con-ception of obligatory connections we must perform between colour and an intended rep-resentation. The objective of addressing the psychological aspect of our response to col-our is simply concluding that we must bear in mind that the implicit associations of light transcend a personal aesthetic opinion into a well defined reaction on behalf of those witnessing a determined lighting.
Light shining down upon us does far more than turning reality visible, it is an analogy of an energetic current that nourishes matter into the life, and the visual feast it provides is the definitive symbol for the amplitude in which its presence anchors our ex-istence.
The colour of light and in light both have an effect on objects that surpasses the perceptible differentiation of given materials; it acts upon the materials themselves polar-izing them into a richer energetic patterns.
The physical and psychological influence of light and colour on our environment can go to such lengths that it is already possible to build a better, safer and healthier environment using light alone.